A CONTRIBUTION TO THE STUDY OF TYPHUS GROUP FEVERS IN RANGOON.

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THESIS PRESENTED

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INTRODUCTION.

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INTRODUCTION.

During recent years a considerable amount of interest has been taken in the Typhus Group of Fevers in Burma. Reports describing cases diagnosed as Typhus have been received from various districts in Burma and many hundreds of samples of sera have been submitted to serological tests by the Weil-Felix reaction.

The writer has seen many cases of Typhus Fever in India, The majority of these cases showing a typical picture were diagnosed on clinical grounds alone although a few were confirmed serologically by the Weil-Felix test, the serum being tested against Proteus X19.

During my service in Rangoon I have seen some cases which have shown a high agglutination titre against various strains of Proteus, but I have not been able to convince myself that these cases could be diagnosed on clinical grounds alone; that is to say the clinical picture did not conform to that described in the literature and the undoubted cases seen by the writer both in India and Burma.

The object of this investigation, therefore, was to see whether any case giving serological findings/

findings which might be regarded as diagnostic of Typhus presented at the same time a clinical picture in any way resembling that described in the literature dealing with Tropical Typhus and conversely whether any cases where a diagnosis of Typhus could be definitely ruled out, yet presented a serological picture characteristic of Typhus.

With this aim in view I decided to take seriatim a hundred cases of pyrexia, excluding Influenzas and other ailments where the diagnosis was obvious, as they were admitted to the Wards of the Rangoon General Hospital or encountered in my practice.

Each case was subjected to a thorough clinical investigation. An effort was made to elicit any history of a febrile attack during the previous twelve months and the duration of the present attack prior to admission to Hospital, This was not always as easy as it sounds on account of language difficulties and lack of intelligence in the patients, since the Rangoon General Hospital caters for all nationalities and admits the homeless, destitute and illiterate, as well as the wealthier members of all communities. Again the language difficulty arises. I have had two Chinamen lying side by side, who could not speak one another's dialects nor could they be understood/

understood by any of the Ward Staff.

Another difficulty arose in following up the cases after they left Hospital, the general rule being that as soon as convalescence is reached the patient quietly disappears from Hospital leaving no address by which he may be traced and indeed many have no address to leave and a few return to India.

Post-mortem examinations present another difficulty. As a rule only unclaimed bodies can be post-mortemed.

Having completed the clinical examination the next step was to test the patient's serum by the Widal Test for B. typhosus, B. paratyphosus A. and B. paratyphosus B., and the Weil-Felix reaction against Proteus OX19, OX2 and OXK. In each case the Wassermann Test was also carried out. Where possible the tests were repeated at intervals. Any further test that suggested itself in any individual case, was carried out.

In Part I a brief resumé of the history of Typhus and Typhus-like Fevers in India, Burma and the Federated Malay States will be given, followed by an enumeration of the main symptoms and signs of Tropical Typhus as observed by other writers and now held to be characteristic of the disease.

This/

This part will conclude with a short account of the serological findings published by various workers in India, Burma and the Malay States.

HISTORY OF TYPHUS AND TYPHUS-LIKE FEVERS IN INDIA AND BURMA.

I have not had access to the very early literature on Typhus in India. I am however indebted to Sir Leonard Rogers (1) who in his classical work on Fevers in the Tropics throws some light on the early accounts of the disease as it existed in India.

The earliest reference in this book is to De Renzy who in 1878 suspected outbreaks of fever with a high mortality, occurring in Jails in the Punjab, to be due to Typhus.

Chevers (2) et alia in 1886 were apparently not wholly satisfied with De Renzy's findings and considered that proof was still wanting. They suspected that some of these outbreaks might be due to Relapsing Fever which was prevalent at the time in North-East India.

In the year 1894 Passani (4) again described further outbreaks from the Punjab, but here again the clinical picture pointed to the possibility of Relapsing Fever.

In 1894 Passani (4) again described an epidemic in North-East India. In this outbreak he observed nine cases of fever of fourteen to nineteen days duration, eight of which showed a very definite morbilliform/

morbilliform rash.

In the same year Vost (5) who, as Rogers states had already had experience of Typhus Fever in Glasgow, recorded an outbreak amongst coolies in Baluchistan. In this outbreak the fever lasted on an average, from thirteen to fourteen days. The pyrexia varied from 102°F. to 104.5°F. and in most cases terminated by lysis. It was accompanied by a high mortality, five out of eighteen cases succumbing to the disease.

Hendley (6) during the years 1891-92 described fifty-three cases in the Peshawar District. Here he appears to have had no doubt about the diagnosis, which he based on the character of the fever and the typical rash. The rash appearing about the fifth or sixth day, was confined to the chest, abdomen and inner sides of the arms. It resembled the rash of Measles, save for the fact that the Measles rash appears early on the forehead and often coalesces to form a crescentic-like appearance.

From a careful analysis of these outbreaks, Rogers considered that Typhus Fever undoubtedly existed in The Punjab.

The next work of importance in India was that of Megaw (7) who published his paper on the Typhus Group of Fevers in 1924. In this contribution he suggested/

suggested the tick as a vector in the Kumaon Hills. In a further paper Megaw (8) seems confident that a tick-borne fever of the Typhus Group occurs in India and suggests the name Tick-Typhus as appropriate. Again Megaw and Rao(9) summarising their findings say

> "there are certain fevers whose clinical manifestations and pathology point to their belonging to the same group, the Typhus Group of Fevers".

He goes on to mention Louse-Typhus, Tick-Typhus and Tsutsugamushi disease and states there are other examples of tick-borne fevers for which other names must be devised. He also points out that in many sporadic cases the vector is not known and that until our knowledge of such cases improves, they should be labelled as belonging to the Typhus Group of Fevers.

In the same article Megaw refers to the work of McKechnie(10). Another paper on a Typhus-like Fever in Central India by Megaw, Shettle and Roy(11) tended to confirm Megaw's previous observations.

We next find work being done in the Federated Malay States by Fletcher and Lesslar(12). In their publication they made the important observation that if with positive clinical signs there is also a positive/

positive Weil-Felix reaction of a titre of 1:200 or over, the disease is definitely diagnosable.

These two writers very rightly take cognisance of Megaw's work already referred to above.

Again in India, Biggam(13) in 1932 describes three cases of Tropical Typhus occurring in Bangalore. He makes several interesting observations in his paper, which will be referred to later.

In the same year Christian(14) described a case of Typhus due to Tick bite. In his discussion he remarked that the case closely resembled Rocky Mountain Spotted Fever, though milder in type. In the case he describes, there was a sixteen day fever with a rash on the fourth day of the disease, other symptoms being hyperaesthesia in the limbs with pains in the muscles and smaller joints.

About this time Kundu(15) published the first case of Typhus in Rangoon. According to Kundu this appeared to be a case similar to the Shop Typhus met with in Malaya.

In 1933 the author and Anderson(16) published a case of Tropical Typhus serologically related to the Scrub Typhus of the Federated Malay States.

In this case we had a definite history of an insect bite although the patient had not seen the biting insect, The later serological findings strongly/

strongly suggested that we were dealing with a variety of Tick Typhus forming another of the rural group of Typhus-like Fevers, a group which includes Tick Typhus of India and the Scrub Typhus of Malaya.

So far as this thesis is concerned these two cases are of paramount importance. They are the first two cases of true Typhus-like Fevers described from Burma, Kundu's case being of the Shop variety and ours of the Scrub type. Both clinically and serologically there appeared to be no doubt as to the diagnosis.

Anderson and I suggested in our paper, the use of the Kingsbury strain of Proteus in addition to OX19, being of opinion that by so doing it would be shown that in Burma as in Malay, there existed two groups of these fevers and that possibly it would be found that the OXK type was commoner than was hitherto suspected. In both Kundu's and our case the clinical picture left little doubt as to the diagnosis but had we not utilised the Kingsbury strain of Proteus in our serological tests, an element of doubt might have crept in.

Maitra and Gupta(17) in the course of three and a half years, examined a large number of sera at the Pasteur Institute of Burma. Being partly financed by Government, this Institute caters for the bacteriological/

bacteriological and serological needs of the whole of Burma. Most of the sera were sent down for examination to ascertain whether or not the patient was suffering from one of the Typhoid Group of Fevers, but it occurred to Maitra, the Director of the Institute, to test all sera, as a routine procedure, against Proteus OX19 and OXK. In the event of positive serological findings the Civil Surgeon concerned was communicated with for further details of the case. In a few instances the Weil-Felix reaction was asked for by the physician in charge of the case. By this method Maitra was able to satisfy himself of the diagnosis in all but two cases which on subsequent investigation turned out to be a case of Typhus and typhoid respectively.

I personally have observed cases from time to time where there were no symptoms at all suggestive of Typhus, but where the serological findings definitely pointed to such a diagnosis. This made me think of the stimulation of heterologous agglutinins mentioned by Stott and to wonder whether Typhus agglutinins could be stimulated by other diseases.

This leads us on to the work of Stott(18) who in 1935 reported a case of Tick Typhus admitted to the King George's Medical College Hospital, Lucknow.

In this case he gives a detailed clinical description/

description of the case and the serological findings. He makes this statement in his summary - 'Typhus toxin has the peculiar property of stimulating intensely but not specifically various antibody producing (haemopoietic) tissues. Further, Typhus serum may show individual or multiple nonspecific serological reactions which are ordinarily considered specific to, and diagnostic of their respective infections.'

These deductions may or may not be convincing, but they are of interest so far as this thesis is concerned.

From 1934 to 1937 various writers have added to the literature on Typhus Fever in India and reference will be made to these contributions later on, the latest contribution from Burma being a paper on a severe case of Scrub Typhus by Kapila and Maitra(19).

SYMPTOMATOLOGY.

There seems to be no reasonable doubt that Typhus Fever is transmitted to man through the agency of an arthropod. In Typhus exanthematicus the louse is known to be the vector. Here no local lesions of any diagnostic significance are present other than those produced by the bite of the louse, a condition present in the majority of working class orientals.

In some forms of the disease however, a more definite local lesion may occur and may give rise to inflammatory reactions in the lymphatic glands of the affected area. In the Tick Typhus of India, Ghose(19) quotes two cases where the patients having been bitten by an arthropod, had painful skin lesions.

My own case had a painful insect bite on the forearm but the nature of the biting insect was not known.

The main symptoms of the Typhus-like Fevers are pyrexia, rash and generalised pains. There seems to be little divergence of opinion amongst the various observers as to the presence of this triad. The symptoms and signs of Typhus exanthematicus are too well known and will not be discussed here.

In describing the symptoms of the Typhus Group of Fevers in more detail I have drawn on the researches of Anigstein(20). This writer carried out

a/

a two years research on the Typhus-like Fevers of Malaya and Malaya being a contiguous country to Burma, with much the same climate and conditions, it is reasonable to presume that there is a similarity in symptoms in the two countries.

Incubation Period.

The incubation period is variable. Lewthwaite (21) gives the incubation period of his cases as lying between eleven and twenty-one days, This writer quotes a case in which a European contracted Typhus eleven days after his return from the jungles.

Fletcher(22) mentions the case of a patient who slept one night in a camp twenty-one days before developing the first symptoms of Tropical Typhus.

Anigstein in his series quotes the cases of two European patients who contracted Typhus fourteen days after leaving the jungle. In the case of two volunteers inoculated experimentally, the disease developed ten and twelve days respectively after inoculation. The ten day case had been inoculated intramuscularly whereas the twelve day case had received a subcutaneous dose.

In the Asiatic it is difficult to obtain a reliable history, partly due to apathy towards insect bites and partly due to the fact that their calling constantly/

constantly keeps them in localities where infection may be acquired.

Amongst other observers Blewitt(23) gives a sixteen day incubation for his cases.

In experiments on animals at the Central Research Institute at Kasauli, it was assumed that the average incubation period for animals was ten days.

Onset.

Generally speaking the onset is more or less sudden for all the Typhus Group of Fevers. There may or may not be a prodromal stage.

The fever is often preceded by a rigor, followed by pains all over the body and severe headache. The headache and pains are often the main complaints from start to finish so far as the patient's subjective symptoms are concerned.

Fever.

In the course of three or four days the temperature rises to 102°F. or higher. In Typhus exanthematicus this level is usually maintained throughout the illness, but in both the Scrub and Urban types of Tropical Typhus, daily remissions have been noted where the morning temperature may fall to 98°F. or thereabouts/

thereabouts. Anigstein noted these remissions in his cases in Malaya.

The duration of the fever seems to differ to some extent. Lewthwaite(24) found that in Tropical Typhus the duration of fever varied from ten to fifteen days, whereas in Anigstein's cases it was fifteen days on the average with a minimum of ten days and a maximum of twenty days. Usually defervescence is by a quick lysis.

Rash.

For a clinical diagnosis of Typhus, the presence of a rash is as essential as the fever. The rash appears during the first few days as discrete pink macules which are rarely palpable. The distribution is over the whole body but the head and the palms of the hands are spared. The Tropical Typhus Fevers differ from Typhus exanthematicus in that in the former the rash appears on the face as well as on other parts of the body.

Anigstein states that the rash is very difficult to find on dark-skinned people such as Tamils.

Fletcher and Lesslar only found the rash well marked in one of seven European cases. On the other hand Lewthwaite though he only rarely found the rash in Tamils found it present in most of the Sikhs and all his European cases. In severe cases the macules after/

after becoming papules tend to become haemorrhagic and are most marked on the back and chest. The rash if slight may be transient or may last throughout the disease if well marked.

Anigstein is of opinion that "the rash cannot be regarded as a constant sign of Tropical Typhus".

Nervous System.

The central nervous system is frequently involved giving rise to all forms of mental disturbance, from a mild degree of mental excitement to delirium and even coma. Headache and giddiness are said to be almost a constant symptom while both Anigstein and Lewthwaite found that deafness was of frequent occurrence.

Pulmonary System.

Cough and a certain degree of bronchitis occur in the majority of cases. Bronchopneumonia occurs in a proportion of cases and indeed may be the immediate cause of death.

Haematology.

The white blood count may show leucopaenia, normality or a varying degree of leucocytosis, the differential count usually showing a lymphocytosis.

Anigstein and Lewthwaite also call attention to the frequent presence (55% and 40% respectively) of enlargement/

enlargement of the axillary lymphatic glands.

These glands are hard and painful and enlarged symmetrically.

Death Rate.

Fletcher and Lesslar consider Tropical Typhus to be a mild disease with a low death rate. Anigstein on the other hand had a death rate of 13.6. He thinks, however, that Urban Typhus is a much milder disease than Scrub Typhus.

SEROLOGY.

Before proceeding to describe my own observations it will be as well to conclude this part by giving a short resume of the serological findings of other investigators, in the Tropical Group of Fevers.

Stott(25) in a case he had under his care in 1935 found that in addition to the patient having a positive Weil-Felix reaction, there was also a positive Widal and a positive Wassermann. In this case he stated that Syphilis and Typhoid could be definitely excluded. In the course of his remarks he goes on to say that such heterologous immune responses have come to be recognised as a characteristic of Typhus sera and more especially against the Proteus group of organisms. He also found a degree of agglutination against B.coli communis, and B. coli communior for a few days during the patient's infection but no agglutination was noted against M.melitensis.

Maitra and Gupta(26) in 1926 investigated the distribution of Typhus Fever in Burma. In the course of two years they diagnosed 109 cases of Typhus from sera sent to them from different parts of Burma.

Serologically these sera reacted for the most part against B. Proteus OXK and OX19, only a few positive/

positive results being obtained with OX2.

In the absence of these serological findings they believe that these cases would have been labelled as belonging to the Enteric Group of Fevers or pyrexia of unknown origin. In this series they only experienced two doubtful cases which on further investigation cleared up; one proving to be Typhoid and the other Typhus. They accepted a standard agglutination of 1:500 for OXK and 1:200 for OX19 as being diagnostic.

Fletcher and Lesslar(27) in 1926 described a series of 18 cases. They were of opinion that provided the clinical signs were present, a titre of 1:200 or over was definitely diagnostic of Typhus. In a further communication(28) they emphasise a positive Weil-Felix test as being diagnostic but insist that the strain of Proteus X19 must be an active one.

For their tests they utilised the Bland Sutton strain, which was obtained from the Lister Institute and which they later called the Kingsbury strain. With this strain they found the Weil-Felix reaction positive in 54 cases of clinical Typhus and negative in 1,000 controls. In their positive findings they took a minimum titre of 1:200 as being diagnostic.

They are of opinion that the various strains used/

used by different authors are not idential but are divided into two groups, the 'K' or Kingsbury strain and the 'W' or Warsaw strain.

Bridges(29) is also of opinion that the Weil-Felix reaction carried out with the 'X' strains of B.Proteus have come to be regarded as a specific diagnostic test.

In a paper circulated to Military Laboratories In India, he gives a very clear exposition of the strains of Proteus used in the diagnosis of Typhus by the Weil-Felix reaction.

Of the three important strains used in the test namely, X19, X2 and XK, he states that X2 was first obtained from the blood of a patient by Dr. Felix. This strain did not give a high titre. Later X19 was obtained in the same way but gave a higher titre.

Both these as far as the 'H' strains are concerned are identical, but they show essential differences in the 'O' composition. It follows therefore, that they should not be regarded as different strains but different 'types' of B. Proteus 'X'.

Later still the third strain or Kingsbury strain of B. Proteus X i.e. the XK strain, was obtained by Dr. Kingsbury from the Lister Institute in 1921 as an ordinary culture of X19, and taken by him to Kaula Lumpur, in the Federated Malay States. After keeping this/

this strain for some years he found that some of his cases which gave a negative Weil-Felix reaction with an X19 strain imported from Warsaw (the 'W' strain) gave a positive reading with the XK strain. This observation eventually led to the distinction between the 'Scrub' and 'Shop' varieties of Typhus.

The Kingsbury 'H' variants resemble those of X2 and X19 but differ from both in the 'O' variant.

Bridges considers a titre of 1:200 or even 1:100 as significant and even 1:50 not to be disregarded if there is any rise in titre during the course of the disease.

Blewitt found in some of his cases that there was a rise in agglutinins for B.typhosus, B.paratyphosus A, and B.paratyphosus B. He has some interesting remarks to make about the Wassermann and Kahn tests. In Blewitt's series these were invariably negative during the first fourteen days. 75% were positive in the third week, 80% in the fourth week and at the end of the sixth week 100% were negative again.

So also in the Weil-Felix test, in which he regards a titre of 1:125 as diagnostic, he found that all his cases were invariably negative during the first week, 60% positive in the second and 100% positive in the third week, while 40% remain negative till the third week. After five or six weeks the curve/

curve begins to fall and by the twelfth week all were well below 1:125.

Another Royal Army Medical Corps worker Wilson (30) describes the case of a soldier who had been transferred from Rangoon to Calcutta, where he contracted Typhus. His serum agglutinated to a low titre with TH, AH, BH and TO. The Weil- Felix was negative to OX2 and OX19 but showed a titre of 1:125 with OXK which in six days rose to 1:500. By the twelfth day the titre had risen to 1:2500. As this case had Malignant Tertian Malaria and also involvement of the lung, and as the clinical picture did not fit in with those cases described by his colleagues Biggam and Blewitt, he rightly concludes that the diagnosis would have been missed out for the routine carrying out of the Weil-Felix Test.

Christian(31) states that the Weil-Felix reaction is negative in the true Enteric Group of Fevers, that is to say in undoubted cases where the Typhoid Bacillus has been isolated from the blood. He also found that in some cases of Typhus Fever, there was an associated rise of agglutinins for B.paratyphosus B.

Christian like Wilson considers that there is a great variation in titre for OX2, OX19 and OXK in Typhus Fevers and considers a titre of 1:250 as diagnostic.

He/

He finds that from three to six months after the fever has subsided there is no evidence of any rise in agglutinins when tested by the Weil-Felix reaction. In 150 normal soldiers only one showed a titre of 1:125 and this leads him to suggest that the arbitrary figure of 1:250 may reasonably be lowered.

From this brief resume of the serological findings by various workers in India and Burma it appears that high Proteus 'O' agglutinins is of high significance and in the diagnosis of Typhus Group of Fevers may be regarded as specific.

Fletcher and Lesslar consider the Weil-Felix reaction as specific if the titre is 1:200 or over along with positive symptoms.

Stott calls attention to heterologous agglutinins.

The main divergence of opinion seems to lie in fixing an arbitrary figure for the titre which can be taken as signifying a positive. Some workers consider a figure as low as 1:150 sufficient and others 1:300 and over.

PART II.

ROUTINE INVESTIGATION OF ONE HUNDRED CASES.

As already stated in the introduction to this Thesis, one hundred cases of fever, other than those where the diagnosis was obvious, were submitted to an ordinary routine examination but in this series in addition to the usual tests, each case was tested for the presence or absence of a positive Weil-Felix Reaction. A note of the Widal findings and Wassermann Reaction was also made.

Each case was carefully watched for any signs of a rash and patients and relatives were also questioned regarding a rash, where possible.

Only those cases showing a definitely positive Weil-Felix Reaction will be described in detail.

The Weil-Felix Reaction.

The Proteus strains used for the Weil-Felix Test in this series were:- Proteus OXK, Proteus OX19 and Proteus OX2.

The strain Proteus 'OXK' was received from the Institute for Medical Research, Kuala Lumpur, Federated/

Federated Malay States, as Proteus 'HXK' and the non-motile 'O' form was obtained from it by growing it on Phenol Agar Plates.

Dr. Kingsbury of Kuala Lumpur originally obtained this strain from the Lister Institute in 1921, as Proteus 'XK19' and maintained the culture for some years. At a later date as mentioned in Part I, Dr. Fletcher thought of testing some of his Proteus 'OX19' (Warsaw) Negative Typhus Sera against this strain and obtained positive reactions. These positive cases were from rural areas. This led to a careful study of the strain when it was found to have changed its 'O' antigen and sugar reactions and to have become non-indologenous. The strain was then named Proteus OXK (Kingsbury Strain).

The strain Proteus OX19 was obtained from the Lister Institute as Proteus HX19 and the non-motile 'O' form was obtained by growing it on Phenol Agar Plates.

The Strain Proteus OX2 was obtained as such from the Enteric Laboratory, Kasauli. The stock cultures of these strains were maintained on Agar slopes, at room temperature.

The suspensions were made from a twenty-four hour growth on Agar slopes. To do this a twenty-four hour broth culture was made from stock and plated on dry/

dry Agar Plates. A non-spreading smooth colony was selected which showed on subsequent testing to be salt stable, non-motile and non-agglutinating with homologous 'H' serum but agglutinating up to the highest titre with homologous 'O' serum. A number of dry Agar slopes (free from any water of condensation) were inoculated from the selected colony and after twenty-four hours incubation, the growth was scraped off and suspended in normal saline.

The opacity was adjusted to 7,500 X 10 per c.c., B.coli count. 0.2% formalin was then added and the suspension then kept in the ice-box till sterile (about a week).

The tests were carried out according to Dreyer's method, one drop of suspension being added to twenty-four drops of serum saline mixture. Dilutions of 1:25, 1:50, 1:125 and 1:250 were used.

The racks were incubated in a water bath at 50°C over night and the reading taken the next day. The result was expressed as the highest dilution which showed standard agglutination. Where a serum showed agglutination up to the 1:250 dilution, it was carried to the end point.

The reduction table used for the Widal Test in The Medical Research Council special report No.51 was used as far as the Widal Test itself is concerned.

Maitra/

Maitra and Gupta took the arbitrary figures of 1:300 and 1:500 because the formalised suspension used by them was almost as sensitive as the living culture. Workers in India on the other hand have been using the alcoholised suspensions which are far less sensitive.

No arbitrary figure has been chosen as a minimal titre diagnostic of Typhus, but as Maitra and Gupta in Burma suggested that a titre lower than 1:300 for B.proteus OX19 and 1:500 for B.proteus OXK might include diseases other than Typhus, I have for the purpose of this research, provisionally diagnosed as Typhus on serological grounds, only those cases in which the titre reached or exceeded these figures.

CASE 1.

A.R., a Chittagonian Coolie, aged 22 years. Mohamedan Male.

Admitted to Hospital on 11.1.37 with a history of fever of two months duration with occasional rigors. No history of headaches, aches or pains or a rash at any time.

Previous History.

Lived in Chittagong, India, from childhood. Had always been healthy up to two or three months prior to coming to Burma when the fever commenced. Felt somewhat better on the ship between Chittagong and Rangoon but relapsed the day prior to disembarkation. Was treated by a 'Quack' for a few days and then got himself admitted to Hospital.

Clinical Examination.

Emaciated and anaemic. Slight Jaundice. Tongue slightly coated.

Spleen enlarged three fingers below costal margin. Liver not palpable. Pulse rather rapid.

No other abnormality detected in any other system.

Laboratory Examination.

Blood - Repeated smears showed no Malaria parasites.
No leucocytosis.

Stools/

Stools - Ova of A. duodenale and ascaris present.

Urine - No albumen, casts etc.

As this man came from Chittagong, a district that regularly supplies Rangoon with cases of Kala Azar, and in view of the fact that this patient had had a prolonged fever with Anaemia, emaciation and enlarged spleen a provisional diagnosis of Kala Azar seemed justified. Accordingly spleen puncture, Formol Gel and Urea Stibamine Tests were carried out on the dates given below.

13.1.37	Formol Gel Test	...	Positive.
	Urea Stibimine Test	...	Positive 1:320.
16.1.37	Spleen puncture	...	No Leishman-Donovan bodies seen by smear examination.

Temperature, on admission was 100°F. in the morning and 103°F. in the evening and continued at a high level. The four hourly chart showed daily remissions to normal and below and on some days a characteristic double rise of temperature in the twenty-four hours. Treatment was commenced on the 20.1.37, i.e. on the tenth day after admission. 0.1 grm. of Neostibosan was given on alternate days for three doses intravenously followed by 0.2 grm. for a further five injections. After the fourth injection the fever showed signs of abating and by the 27.1.37 reached normal. There was a reaction after the fifth dose when the evening temperature rose to 101°F., after/

after which the patient made an uninterrupted recovery. A total of 1.3 grms of Neostibosan were given in all. The patient left Hospital on the 1st March of his own accord and by this time the spleen had completely receded.

24.2.37.	Formol Gel Test	...	Negative
	Urea Stibamine Test	...	1:80
28.1.37.	Wassermann Reaction) and Kahn Test)	...	Negative
4.2.37.	-do-	...	Negative.

SEROLOGICAL INVESTIGATION.

Widal Test.

23.1.37. B.Typhosus H. Marked agglutination 1:35 RT=9
B.para A & B H. negative 1:25 and over.
B.typhosus O. Marked agglutination 1:17 RT=1

2.2.37 B.typhosus H. Marked 1:340 RT = 37.
B.para A . B H. negative 1:25 and over.
B.typhosus O. Marked 1:17 RT = 1.

Weil-Felix Reaction.

23.1.37. B.proteus OXK marked agglutination 1:770
B.proteus OX19 negative 1:25 and over.
B.proteus OX2 negative 1:25 and over.

4.2.37. B.proteus OXK marked agglutination 1:1280.
B.proteus OX19 negative 1:25 and over.
B.proteus OX2 negative 1:25 and over.

19.2.37. B.proteus OXK marked 1:800, weak in 1:1600.
B.proteus OX19 and OX2 negative 1:35 and over.

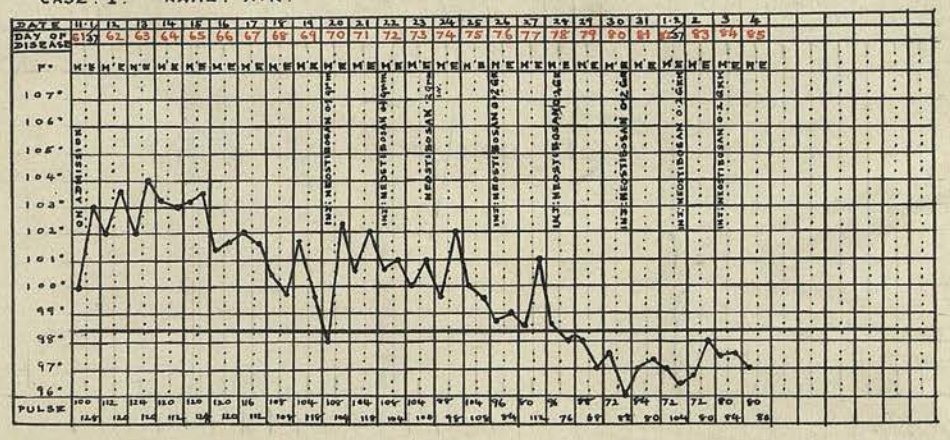
Clinical diagnosis - Kala Azar.

Serological diagnosis - Scrub Typhus (Kingsbury OXK).

No rash and no history of insect bite.

No glandular enlargement.

CASE. 1. NAME. A.R.



CASE 2.

Mr F.T.R. European Male, aged 35. Admitted 4.1.37.

Previous History.

History of Malaria some years ago. No other history of importance. He is employed by a big commercial firm in Rangoon where he has been resident for some years.

History of Onset.

Continuous fever off and on for two weeks. Fever ranged between 102°F. and 103°F. but at intervals touched normal. Experiences intense cold just before onset of fever and when the temperature is at its height he experiences intense headache. Feels very weak and exhausted after these attacks.

There is no history of insect bites and he denies history of exposure to venereal disease.

Physical Examination.

General condition is good. Tongue coated but moist. Spleen just palpable. Lungs and all other organs seem to be healthy. He complains of pain in the right chest, which is aggravated by movement.

Course.

He ran an intermittent temperature in hospital. He/

He is very irritable and restless and frequently gets out of bed.

A week after admission to Hospital and twenty-one days after the onset of fever, he developed a rash which was most marked on the face and chest and soon covered the whole body reaching its height at the end of a week. The rash was macular and of a coppery colour, very suggestive of a secondary lues.

This led to the Wassermann and Kahn Tests being done on the 18.1.37, both tests showing a strong positive. On the results of these tests being made known to the patient he admitted having exposed himself to infection about two months previously but had no knowledge of a primary sore.

On the 23.1.37 he was given an intravenous injection of 0.02 grm. of N.A.B. and 1 c.c. of Casbis intramuscularly. On the following day the temperature dropped to normal and remained so for the rest of his stay in Hospital. The rash also faded rapidly and disappeared by the end of the month leaving no staining.

Laboratory Tests.

Blood for M.P. negative on four occasions.
Blood picture - Total W.B.C. 9,230. Reds 4,230,000.
Polymorphs 64%
Monos. 7%
Lymphos. 26%
Eosinos. 3%.

Haemoglobin 80%. No apparent changes in r.b.cs.

Urine. Albumen a trace. No sugar. No casts or pus cells. Culture showed staphylococci.

SEROLOGICAL INVESTIGATION.

Widal Test.

16.1.37. B.typhosus H. marked agglutination 1:34 RT= 3
B.para AH " " 1:75 RT=15
B.para BH " " 1:141 RT=28.
(B.typhosus O
(B.para BO both negative 1:25 and over.

Weil-Felix Reaction.

11.1.37. B.proteus OXK 1:1600
B.proteus OX19 1:200.
B.proteus OX2 negative 1:25 and over.

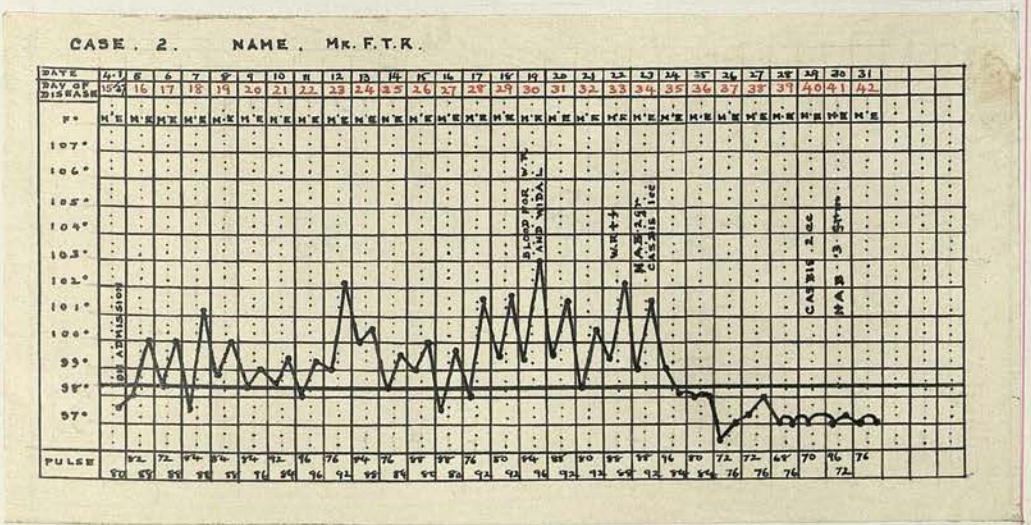
19.1.37. B.proteus OXK 1:1600.
B.proteus OX19 negative 1:25 and over.
B.proteus OX2 negative 1:25 and over.

30.1.37. B.proteus OXK 1:1600
B.proteus OX19 negative 1:25 and over.
B.proteus OX2 negative 1:25 and over.

Clinical Diagnosis. P.U.O. with secondary lues.

Serological Diagnosis. - Scrub Typhus and secondary lues. Rash highly suggestive of secondary Syphilis, appeared after twenty-one days of fever and lasted twenty days, rapidly disappearing after a small dose of N.A.B.

Pyrexia lasted 34 days.



CASE 3.

N.B. Nepalese Male, aged 25. Admitted on 22.2.37.

Complaint.

Continuous fever with pain in the limbs and severe headache of ten days duration. Also complained of severe pain behind eyeballs and in region of umbilicus.

Previous History.

Pneumonia three years ago. Malaris four years ago. No other history of illness. Has been in Rangoon for past two years.

Physical Examination.

General condition fair. Tongue coated. No congestion of throat. Bowels constipated.

Liver palpable. Spleen not palpable.

Lungs show scattered rales and rhonchi on both sides, more marked at bases.

No abnormality detected in other organs.

Course.

Temperature on admission was 102°F. and pulse 104. The temperature remained more or less at this level with morning remissions till 26.2.37 i.e. for four days when it fell by lysis to normal on 2.3.37 and/

and thereafter remained normal. The fever throughout was of a mild nature and lasted in all eighteen days.

Laboratory Tests.

No Malaria parasites and no leucocytosis.

Urine, stools and blood picture showed no abnormality.

SEROLOGICAL FINDINGS.

Widal Test.

27.2.37. B.typhosus H marked agglutination 1:38 RT=4
B.para AH negative 1:25 and over.
B.para BH negative 1:25 and over.
B.typhosus O marked agglutination 1:17 RT=1
B.para BO negative 1:25 and over.

8.3.37 B.Typhosus H marked agglutination 1:3000 RT=333
B.para AH negative 1:25 and over.
B.para BH negative 1:25 and over.
B.typhosus O marked agglutination 1:32 RT=2
B.para BO marked agglutination 1:17 RT=3

29.3.37. B.typhosus H marked agglutination 1:170 RT=18
B.para AH and BH negative 1:25 and over.
B.typhosus O marked agglutination 1:17 RT=1
B.para BO negative 1:25 and over.

Weil-Felix Reaction.

2.2.37. B.proteus OXK marked agglutination 1:74.
B.proteus OX19 marked agglutination 1:1280.
B.proteus OX2 marked agglutination 1:28.

5.3.37. B.proteus OXK marked agglutination 1:64.
B.proteus OX19 marked agglutination 1:1700.
B.proteus OX2 negative 1:25 and over.

25.3.37. B.proteus OXK marked agglutination 1:44.
B.proteus OX19 marked agglutination 1:565.
B.proteus OX2 negative 1:25 and over.

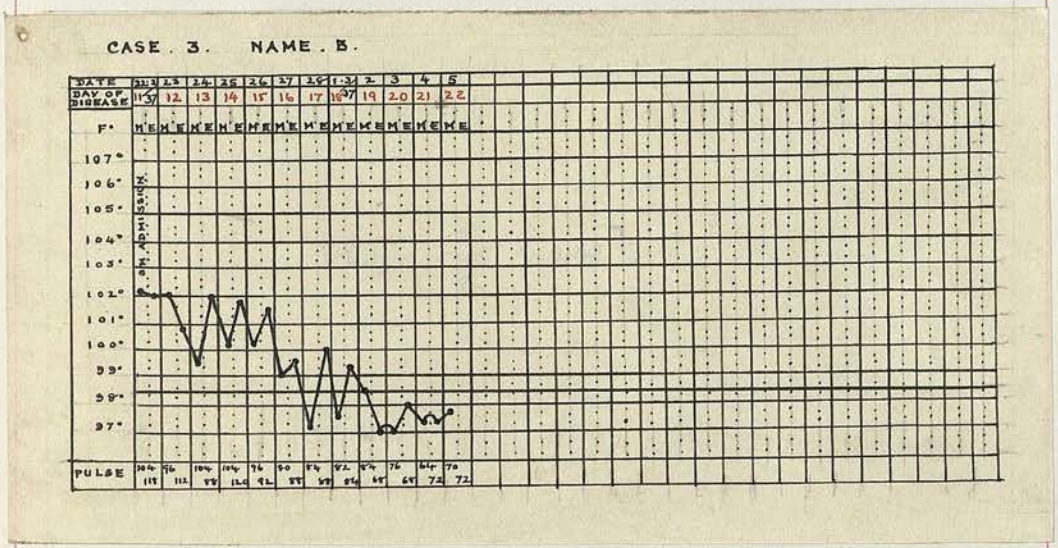
1.3.37. Wassermann and Kahn negative.

Clinical/

Clinical Diagnosis ? Typhus Fever.

Serological Diagnosis. Shop Typhus.

There was no rash discernable and no history of insect bite. No glandular enlargement.



CASE 4.

Mr. M.R. Mohamedan Male, aged 17. Admitted 18.3.37.

Complaint.

Fever with rigor and severe headache for last three days. States that fever comes on in the morning and leaves him in the evening. No history of previous attacks of this nature.

Previous History.

Infancy and childhood spent in Bengal, Came to Burma four years ago since when he has resided in Rangoon City.

Physical Examination.

General condition very unsatisfactory, Tongue coated, no Anaemia or Jaundice, abdomen soft.

Liver and spleen palpable.

Rales and rhonchi heard over both lungs.

Nothing abnormal detected in other organs.

Course.

Temperature remained at a high level throughout, except on the third day after admission when the morning temperature fell to subnormal only to rise again to 103°F. in the evening.

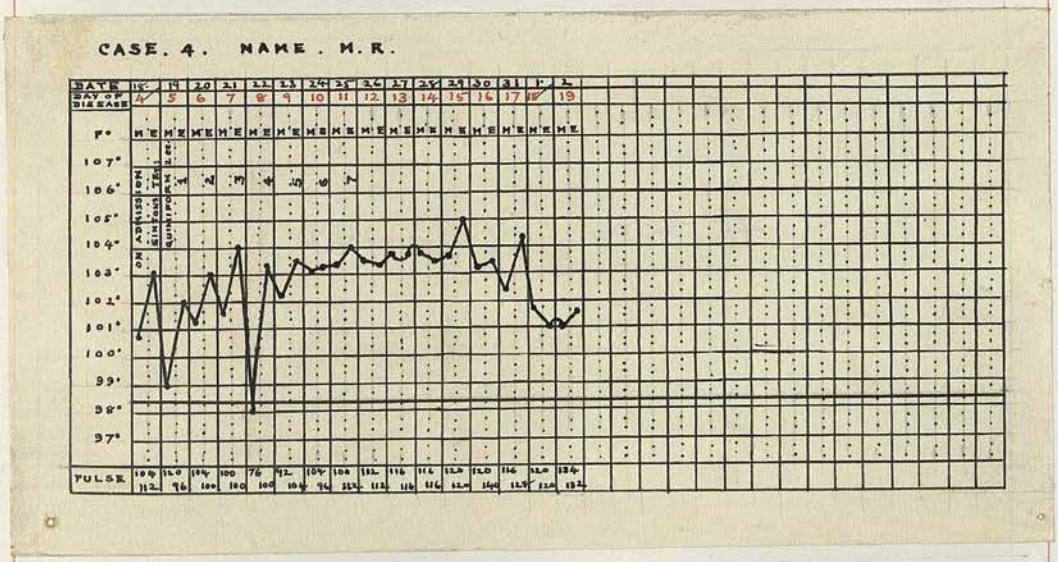
On/

On the second day palpation of the abdomen elicited definite gurgling in the right iliac fossa.

On the 1.4.37 he passed blood in the stools. Abdomen became retracted and the patient became restless and delirium supervened. The following day the condition was very low, he had another large melaena stool followed by a further haemorrhage and died the same night.

Laboratory Tests.

Total white cell count 10,000 per c.mm. otherwise nothing to note.



SEROLOGICAL INVESTIGATION.

Widal Test.

22.3.37	B.typhosus H marked agglutination	1:1700	RT=189
	B.para AH marked agglutination	1:680	RT=136
	B.para BH negative 1:25 and over.		
	B.TO marked agglutination	1:1925	RT=120
	B.para BO	1:1000	RT=200

2./

2.4.37 B.typhosus H marked agglutination 1:3850 RT=428
B.para AH marked agglutination 1:5650 RT=1130
B.para BH negative 1:25 and over.
B.typhosus O marked agglutination 1:1925 RT=120
B.para BO marked agglutination 1:192 RT=38

Weil-Felix Reaction.

22.3.37. B.proteus OXK marked agglutination 1:600
B.proteus OX19 marked agglutination 1:150
B.proteus OX2 marked agglutination 1:56

2.4.37. B.proteus OXK marked agglutination 1:565
B.proteus OX19 marked agglutination 1:170
B.proteus OX2 marked agglutination 1:56

Wassermann and Kahn negative on 20.3.37 and 3.4.37.

No history of insect bite, no glandular enlargement and no rash seen.

Clinical Diagnosis - Typhoid Fever.

Serological Diagnosis - Scrub Typhus and Typhoid.

NOTE. At first sight the Widal Test might suggest that the patient had been inoculated against the Typhoid Group of Fevers, but the high 'TO' agglutination leaves little doubt in my mind that, taken with the clinical picture, the case was a Typical Typhoid Fever with haemorrhage at the beginning of the third week.

The serological findings in this case call to mind Stott's heterologous agglutinins.

CASE 5.

M. Mohamedan Male, aged 13. Admitted 25.3.37.

Complaint.

Fever and weakness of six days duration.

Previous History.

Born and brought up in Chittagong, Bengal. Came to Rangoon four months ago, Had fever off and on in Bengal.

Physical Examination.

He is weak, anaemic and emaciated. Spleen is enlarged four fingers below costal arch. Liver just palpable. Examination of heart shows haemic murmurs in all areas. There are a few rales at both bases of the lungs.

Laboratory Tests.

Blood. Total leucocyte count 3,000 per c.mm.
Total Red count 3,090,000 per c.mm.
Haemoglobin percentage 60.

Differential - Polymorphs 65%
Lymphocytes 28%
Large Monos. 4%
Eosinophiles 3%

Red blood cells show poikilocytes, anisocytosis and polychromasia. A very definite Secondary Anaemia.

No Malaria parasites seen.

Spleen/

Spleen Puncture.

No Leishman-Donovan bodies seen.

30.3.37 Formol Gel Test - Strong positive
Urea Stibamine Test - Strong positive 1:320

Course.

Temperature remained high from 25.3.37 to 3.4.37 in spite of a course of Sinton's Quinine and Alkali Treatment for seven days.

On the 3.4.37 a course of intravenous injections of Neostibosan was commenced in doses of 0.05, 0.1, 0.2, 0.2 and 0.2 grms. The drug was given daily. There was an almost immediate response, the temperature coming down to normal on the 5.4.37 and remaining so. The spleen and liver receded and were no longer palpable. The four-hourly chart showed a typical double rise in the twenty-four hours, during the height of the fever, a characteristic feature of Kala Azar.

SEROLOGICAL INVESTIGATION.

Widal Test.

31.3.37)
17.4.37) Negative 1:25 and over.

Weil-Felix Reaction.

30.3.37. B.proteus OXK marked agglutination 1:1130
B.proteus OX19 negative 1:25 and over.
B.proteus OX2 negative 1:25 and over.

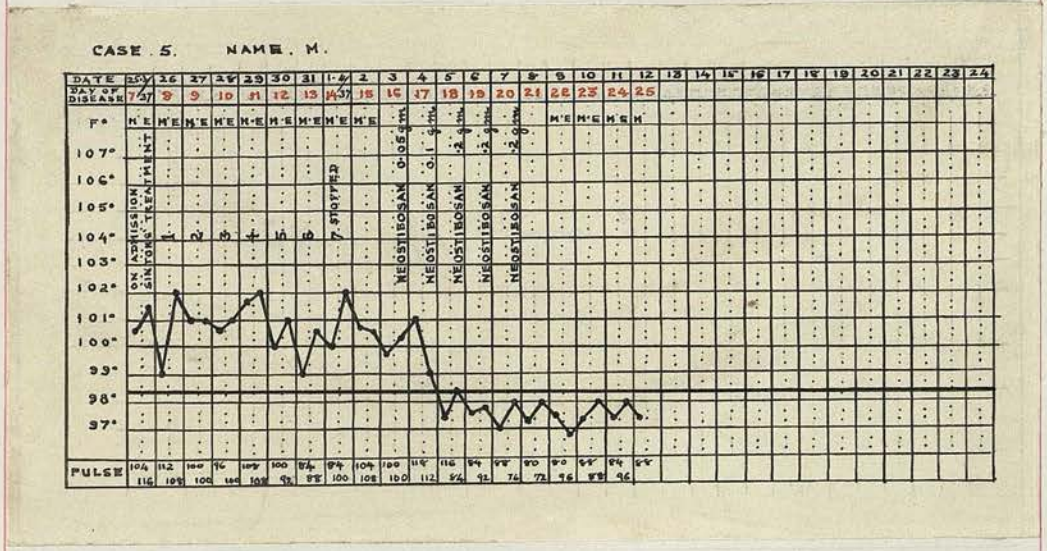
14.4.37. B.proteus OXK marked agglutination 1:1500
B.proteus OX19 negative 1:25 and over.
B.proteus OX2 negative 1:25 and over.

Clinical/

Clinical Diagnosis.- From the character of the fever, blood picture, double rise of temperature, Formol Gel and Urea Stibamine Tests, a diagnosis of Kala Azar was made.

Serological Diagnosis - Scrub Typhus.

No rash, no glandular enlargement and no history of insect bite.



CASE 6.

Mr. V. Hindu Male, aged 35. Admitted on 8.4.37.

Complaint.

Fever with pain in the chest of three weeks duration. Pain in all the joints since onset of fever.

Previous History.

Patient comes from Malabar. Left in Hospital by relatives who disappeared. Patient too ill to give any sort of history.

Physical Examination.

Patient appears to be moribund. Spleen enlarged two fingers below costal arch. Liver not enlarged. Heart rapid, Scattered rales and rhonchi over both lungs. Nothing else of importance.

Course.

Temperature ranged between 102°F. and 105°F.

On the 11.4.37, neck became rigid. Patient became very restless and incoherent. Pupils equal and reacted to light. Kernig's sign present. Lungs showed consolidation at both bases. Lumbar puncture revealed a clear cerebrospinal fluid which was not under pressure.

Patient/

Patient died on 12.4.37 five days after admission.

When he was first admitted it was suspected that he may be a case of Cerebral Malaria and he was treated accordingly.

Laboratory Tests.

No Malaria parasites found in peripheral blood. There was an apparent leucocytosis present. Nothing else of importance found in urine, stools etc.

SEROLOGICAL INVESTIGATIONS.

Widal Test.

12.4.37. Widal negative 1:25 and over.

Weil-Felix Reaction.

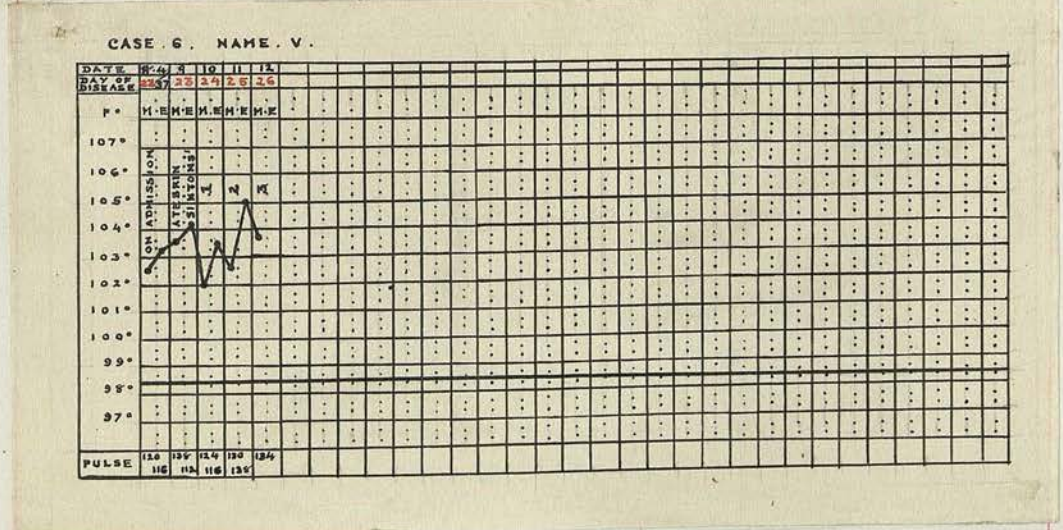
10.4.37. B.proteus OXK marked agglutination 1:56
B.proteus OX19 marked agglutination 1:6450
B.proteus OX2 marked agglutination 1:22

Clinical Diagnosis - ? Shop Typhus.

Serological Diagnosis - Shop Typhus.

Wassermann Reaction on 13.4.37 Positive.

No rash, glandular enlargement or history of insect bite.



CASE 7.

K.A.G. Burmese Male, aged 62. Admitted 18.4.37.

Complaint.

Intermittent fever with rigors of ten days duration. Does not live in Rangoon City.

Previous History.

Being a man of low intelligence, he is unable to give any reliable account of himself. Says he has always been well. Does not remember having been bitten by insects.

Physical Examination.

General condition fair. Marked pyorrhoea alveolaris. Wheezing sounds in chest. Air entry good and no dullness on percussion. Bowels constipated. On 21.4.37 liver became enlarged upwards and was tender on deep percussion. Bases of lungs became full of rales and percussion note was impaired.

Course.

Temperature ranged between 98°F. and 101°F. As his liver was enlarged and tender the possibility of an amoebic hepatitis arose and with this suspicion in view, he was given a course of Emetine intramuscularly, the dose being one grain daily for seven days. After this the temperature settled down to normal and remained so.

Laboratory Tests.

Blood - Total leucocyte count 8,200 per c.mm. Differential showed no abnormality.

Stools - No protozoa or ova. No cellular exudate.

Urine - A trace of albumen. Otherwise nothing abnormal.

Wassermann Reaction. Double plus.

SEROLOGICAL INVESTIGATION.

Widal Test.

Entirely negative on 28.4.37, 8th and 26th.5.37 in dilutions of 1:25 and over.

Weil-Felix Reaction.

25.4.37. B.proteus OXK marked agglutination 1:28
B.proteus OX19 marked agglutination 1:3000
B.proteus OX2 negative 1:25 and upwards.

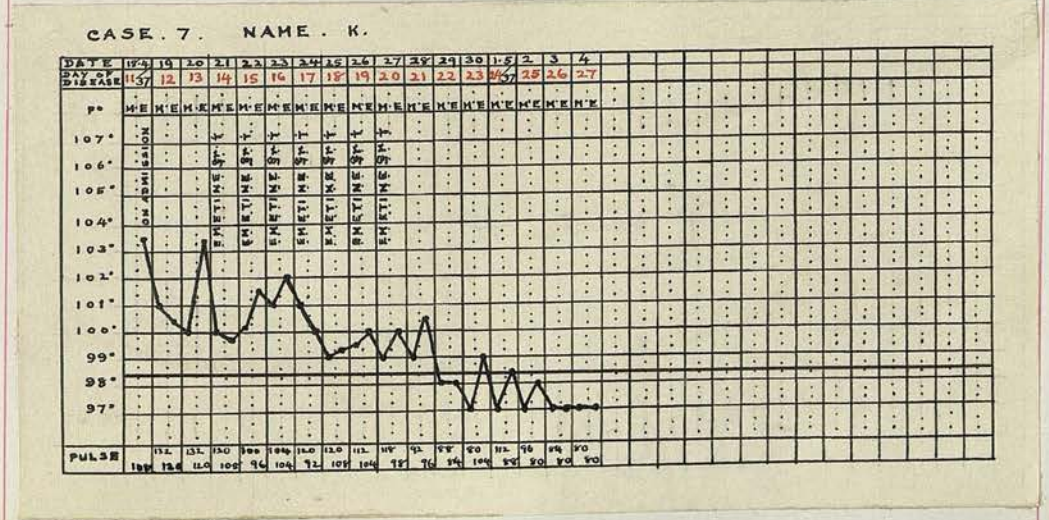
8.5.37. B.proteus OXK marked agglutination 1:30
B.proteus OX19 marked agglutination 1:1700
B.proteus OX2 negative in 1:25 and over.

26.5.37. B.proteus OXK marked agglutination 1:30
B.proteus OX19 marked agglutination 1:300
B.proteus OX2 negative 1:25 and over.

Clinical Diagnosis - ? Malaria with hepatitis.

Serological Diagnosis - Shop Typhus.

No rash, glandular enlargement or history of insect bite.



CASE 8.

D.S.R. Indian Male, aged 50. Admitted 6.5.37.

Complaint.

Continuous fever for eight days with severe frontal headache and pains all over the body. No rigors, no history of Malaria and no knowledge of having been bitten by an insect.

Previous History.

Has always enjoyed good health in the past. Lived in Madras up to ten years ago when he came to Rangoon, where he has been ever since.

Physical Examination.

Except that the liver and spleen are just palpable, no abnormality could be detected in any organ.

Course.

Temperature on admission was 100.6°F. and remained round about 100°F. for the next four days when it returned to normal. Headache and pains were relieved and he left Hospital on 17.5.37 at his own request.

Laboratory Tests.

No Malaria parasites seen. No apparent leucocytosis. Urine, stools etc. showed no abnormality.

SEROLOGICAL INVESTIGATION.

Widal Test.

11.5.37. All negative in 1:25 and over.

20.5.37. All negative in 1:25 and over.

Weil-Felix Reaction.

11.5.37. B.proteus OXK marked agglutination 1:34
B.proteus OX19 marked agglutination 1:282
B.proteus OX2 marked agglutination 1:28

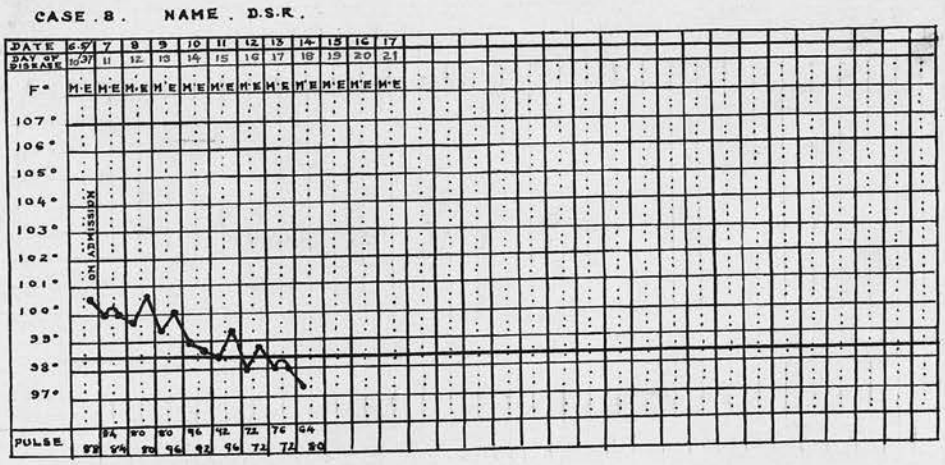
20.5.37. B.proteus OXK marked agglutination 1:75
B.proteus OX19 marked agglutination 1:300
B.proteus OX2 marked agglutination 1:141.

Wassermann negative on 8.5.37 and 17.5.37.

Clinical Diagnosis - Pyrexia of unknown origin

Serological Diagnosis - Shop Typhus.

No rash. No glandular involvement and no history of insect bite.



CASE 9.

R.W.L. European Male.

Complaint.

Fever with severe prostration of two days duration. No joint or muscle pain, but severe pain behind eyeballs.

Previous History.

Of no importance.

History of Recent Movements.

Went a journey by launch up the Irrawaddy River on April 3rd, 1937. Was away for two days in the jungles and slept those nights in a country boat. The fever commenced on the 16.4.37, eleven days after his return to Rangoon.

Course.

The fever was of a remittent type, quickly rising to 103.6°F. and on the 22.4.37 (the seventh day of the illness) reached 104.4°F. It remained up till 26.4.37 when it began to fall by lysis, reaching normal on the 29.4.37. There were daily morning remissions of about two degrees. Prostration was very marked from the second day onwards and out of all proportion to the fever. Convalescence was also very slow.

The/

The eyes were congested and movement of the eyeballs caused pain. Headache was a marked feature during the first few days only. The pulse was slow throughout. Constipation was obstinate. There was nothing abnormal to note in any other system.

Rash.

About the fifth day of fever a few rose spots were seen on the abdomen and left arm near the antecubital fossa. These cleared up in two days and left no staining. The rash was more suggestive of an Enteric than Typhus.

Laboratory Tests.

Blood - Showed a leucopaenia. No Malaria parasites seen on repeated examination.
Blood culture on the sixth day was sterile on bile media.

Urine - Very highly coloured. No bile salts but urobilin present. The colour was deeper than that of a febrile urine but rapidly cleared up with dieuretics.

SEROLOGICAL INVESTIGATION.

Widal Test.

24.4.37	B.typhosus H	marked agglutination	1:322	RT 35
	B.para AH	marked agglutination	1:32	RT 64
	B.para BH	marked agglutination	1:322	RT 64
	B.typhosus O	marked agglutination	1:34	RT 2
	B.para BO	marked agglutination	1:19	RT 3

The/

The above result suggested past inoculation with T.A.B. vaccine and the patient had been inoculated on several occasions.

Weil Felix Reaction.

28.4.37. B.proteus OXK marked agglutination 1:56
B.proteus OX19 marked agglutination 1:600
B.proteus OX2 marked agglutination 1:320

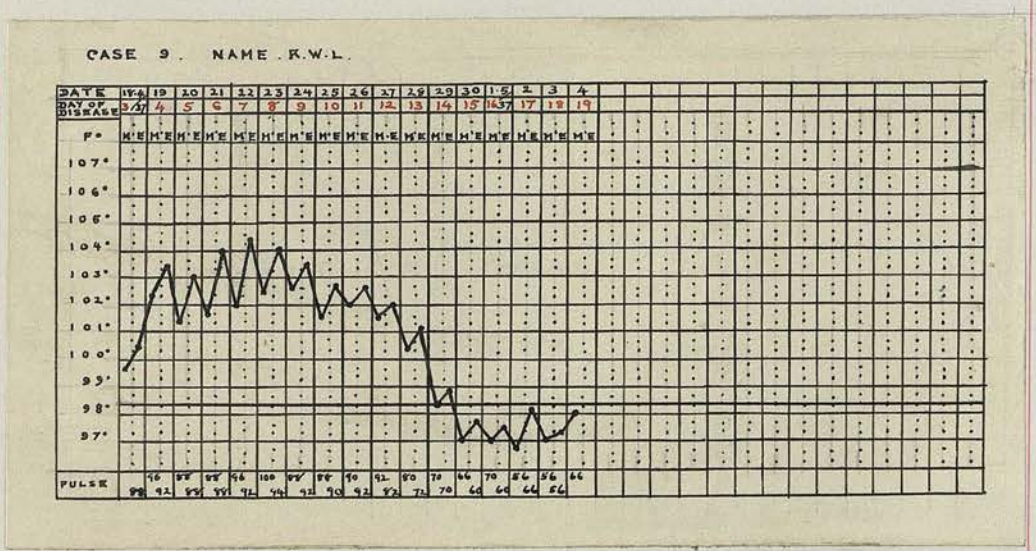
25.6.37. B.proteus OXK marked agglutination 1:56
B.proteus OX19 marked agglutination 1:30
B.proteus OX2 marked agglutination 1:64

Wassermann and Kahn both negative.

Clinical Diagnosis - Typhus.

Serological Diagnosis - Shop Typhus.

NOTES. This case showed a rash though the rash was not typical of Typhus Fever. There was no history of an insect bite and there was no glandular involvement.
The fever lasted in all fourteen days. This is the only case of the series where it was at all possible to gauge an incubation period.



CASE 10.

Mr. N. Hindu Male, aged 26. Admitted on 9.5.37.

Complaint.

Fever, headache and pains all over the body of ten days duration.

Previous History.

Has been in Rangoon for six years and has always kept good health. No history of Malaria or any prolonged fever.

Physical Examination.

Tongue coated. Abdomen soft and not tender. Liver not palpable, spleen just palpable. Heart rapid. Lungs clear. Other symptoms normal.

Course.

Temperature on admission was 101°F. rising to 102°F. in the evening, Came down to normal on the fifth day after admission, the fifteenth day of the illness. After this he made a rapid and uneventful recovery.

Laboratory Tests.

Blood - No Malaria parasites and no apparent leucocytosis.

Urine and stools showed no abnormality.

Wassermann/

Wassermann double positive on 10.5.37 and 21.5.37.

SEROLOGICAL INVESTIGATION.

Widal Test.

10.5.37. B.typhosus H)
B.para AH) All negative 1:25 and over.
B.para BX)
B.typhosus O marked agglutination 1:32 RT 2
B.para BO negative 1:25 and over.

21.5.37. Negative to all.

Weil-Felix Reaction.

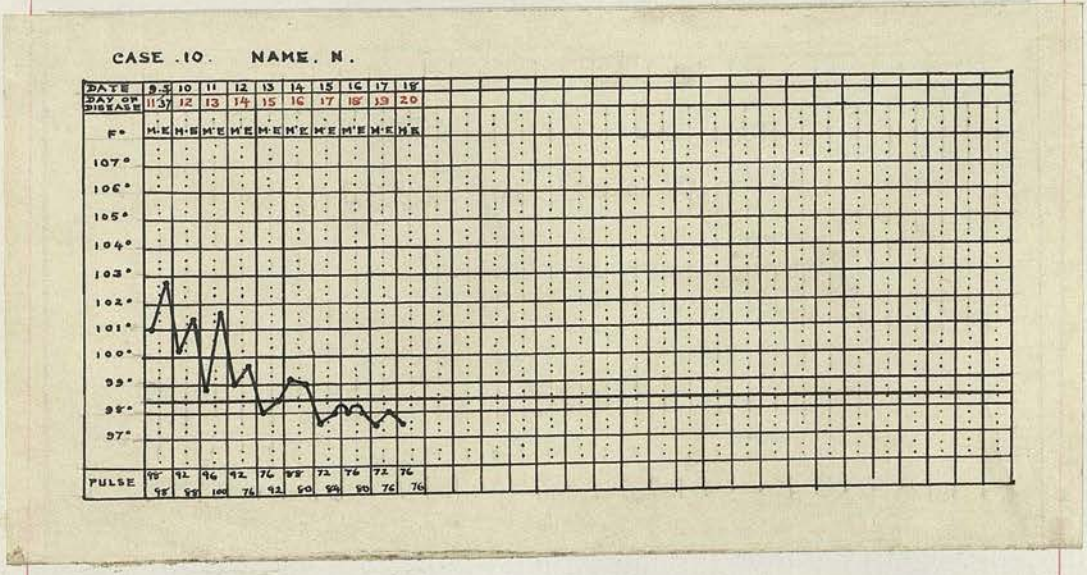
10.5.37. B.proteus OXK marked agglutination 1:74
B.proteus OX19 marked agglutination 1:5650
B.proteus OX2 marked agglutination 1:56

21.5.37. B.proteus OXK marked agglutination 1:74
B.proteus OX19 marked agglutination 1:1500
B.proteus OX2 marked agglutination 1:52

Clinical Diagnosis - ? Typhus.

Serological Diagnosis - Shop Typhus.

There was no rash, no history of insect bite and no glandular involvement.



CASE 11.

T.P.B. Hindu Male, aged 40. Admitted 17.5.37.

Complaint.

Fever of ten days duration with severe headache and constipation.

Previous History.

History of Malaria five years ago. Has been in Burma for the last twelve years. He is resident in Rangoon but tours in the district.

Physical Examination.

Tongue thickly coated. Abdomen soft. Liver and spleen not palpable. Heart, lungs, nervous system etc. normal.

Course.

Temperature on admission was 101°F. Ranged between 101°F. and 102.8°F. with morning remissions to below normal, for three days. On 20.5.37 Quinine Treatment was commenced and the following day temperature reached normal and remained so. On 23rd and 25th he had slight evening rises to 99.8°F. and 99.6°F. after which he remained normal till 31.5.37 when he was discharged.

Laboratory/

Laboratory Tests.

Blood - Total leucocyte count 12,600.
No Malaria parasites seen.

Stools and urine showed no abnormality.

Wassermann was doubtful on 30.5.37, but negative to Klein and Kahn.

SEROLOGICAL INVESTIGATION.

Widal Test.

17.5.37 and 29.5.37 entirely negative 1:25 and over.

Weil-Felix Reaction.

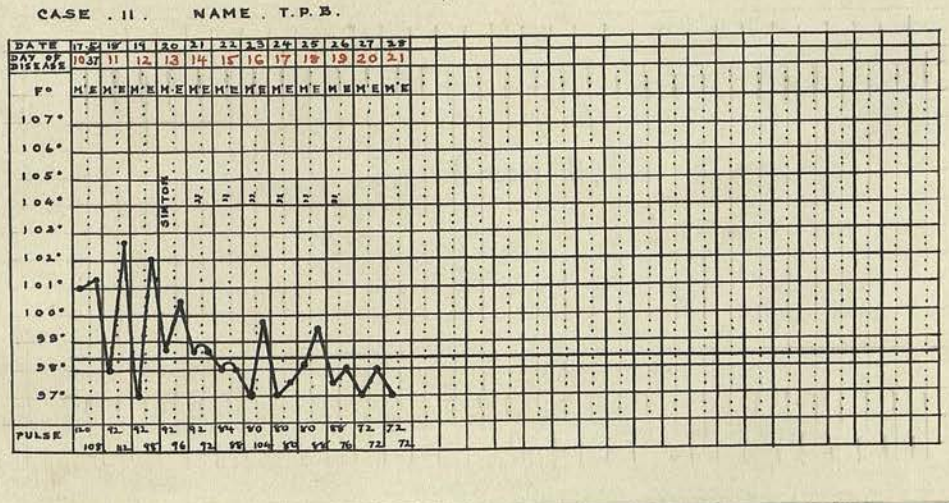
17.5.37. B.proteus OXK marked agglutination 1:34
B.proteus OX19 marked agglutination 1:400
B.proteus OX2 marked agglutination 1:44

28.5.37. B.proteus OXK marked agglutination 1:800
B.proteus OX19 marked agglutination 1:800
B.proteus OX2 marked agglutination 1:141

Clinical Diagnosis - Malaria.

Serological Diagnosis - Typhus Group.

No rash, no history of insect bite and no glandular involvement.



CASE 12.

M.G. Chittagonian Male, aged 46. Admitted 18.5.37.

Complaint.

Fever and headache of ten days duration. Pain all over the body and especially in elbow and wrist joints. Dyspepsia and dislike for food.

Past History.

He had fever five months ago in Chittagong. First came to Burma in 1910 since when he has travelled backwards and forwards staying in Chittagong for six months at a time. Has been in Burma now for one month.

Physical Examination.

Tongue coated, teeth bad, abdomen soft, bowels constipated. Spleen just palpable, liver not palpable. Other organs show no abnormality.

Course.

Temperature on admission was 98.4°F. in the morning and 99.6°F. in the evening. Reached 100°F. during next two evenings, with morning remissions. He was put on Quinine Treatment on the third day after admission and the temperature slowly reached normal by the fifth day. As he complained of severe arthritic pains/

pains in the left wrist and elbow, he was also given a course of sterile milk injections intramuscularly which caused a fairly sharp reaction with much benefit. He left Hospital of his own accord on the 12th June, 1937.

Laboratory Tests.

Sputum - Negative to Tubercle Bacillus.

Urine and stools showed no abnormality.

Blood - Leucopaenia. Total leucocyte count 3,600 per c.mm.
Total red count 3,130,000.
Haemoglobin 55%.
Red cells showed poikilocytosis, anisocytosis and polychromasia.
No Malaria parasites seen.

Gastric analysis showed a hypochlorhydria.

SEROLOGICAL INVESTIGATION.

Widal Test.

Entirely negative 1:25 and over on 20.5.37 and 25.5.37.

Weil-Felix Reaction.

20.5.37. B.proteus OXK marked agglutination 1:4400
B.proteus OX19) negative 1:25 and over.
B.proteus OX2)

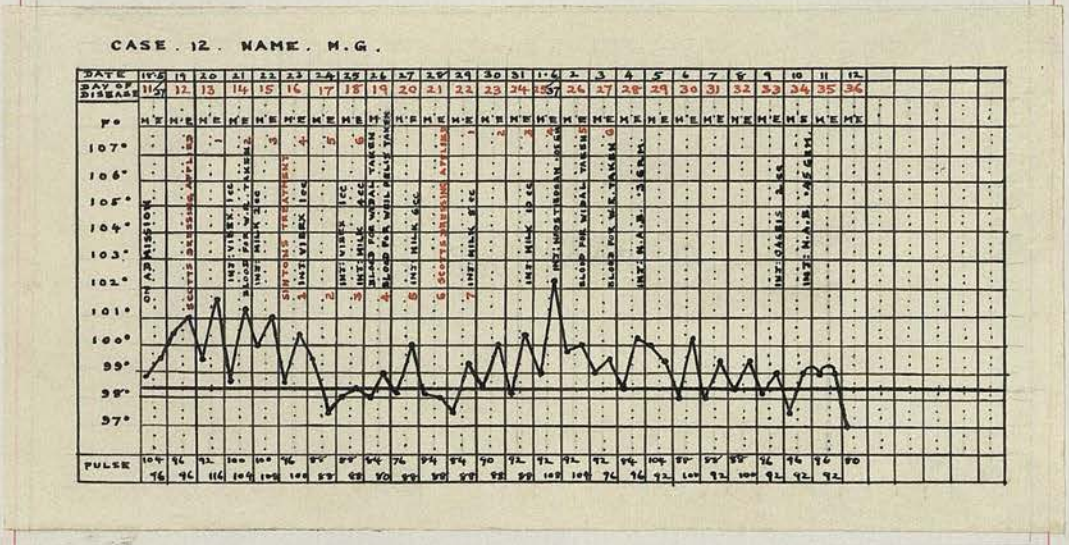
26.5.37. B.proteus OXK marked agglutination 1:3800
B.proteus OX19) negative 1:25 and over.
B.proteus OX2)

Wassermann - Strong positive on 20.5.37 and 26.5.37.
Kahn Test - Positive on 26.5.37.

Clinical/

Clinical Diagnosis - ? Typhus Group with marked Secondary Anaemia.

Serological Diagnosis - Scrub Typhus.



CASE 13.

S.D. Hindu Female, aged 18. Admitted 17.5.37.

Complaint.

Fever with cough of 12 days duration.

Previous History.

Recently came from India where she had Malaria two years ago. Just before coming to Burma had recovered from a ten days fever.

Physical Examination.

Anaemic. Irritating cough. Throat congested. Breath sounds harsh at right apex. Spleen three fingers below costal arch. Liver not enlarged. Heart, nervous system etc. normal. Glands in groins palpable.

Course.

Temperature on admission was 102°F. This case was diagnosed as Malaria and patient was put on Quinine Treatment. Fever came down after four days.

Laboratory Tests.

Urine - No abnormality.
Stools - Ova of ascaris.
Blood - No Malaria parasites seen and no apparent leucocytosis.

Formal Gel Test - Negative.
Urea Stibamine Test - Positive 1:80, negative 1:160.
Wassermann Reaction - Negative.

SEROLOGICAL/

SEROLOGICAL INVESTIGATION.

Widal Test.

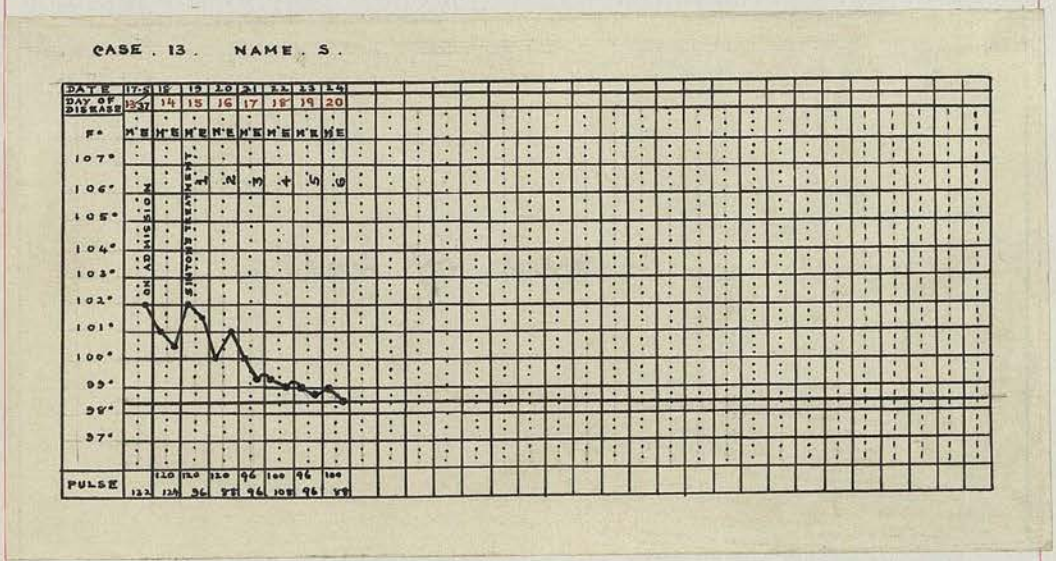
26.5.37. All negative 1:25 and upwards.

Weil-Felix Reaction.

26.5.37. B.proteus OXK marked agglutination 1:800
B.proteus OX19) negative 1:25 and upwards.
B.proteus OX2)

Clinical Diagnosis - Malaria.

Serological Diagnosis - Scrub Typhus.



CASE 14.

J. Hindu Male, aged 39. Admitted 3.6.37.

Complaint.

Fever of ten days duration. Severe headache and pains all over body. Slight cough. Vomited four or five times at onset of fever.

Previous History.

Has been in Rangoon for past eight years. No previous illness of any importance.

Physical Examination.

Tongue coated. Abdomen soft and flabby, but not tender. Bowels constipated. Liver and spleen not palpable. Lungs, heart and nervous system normal. No glandular enlargement.

Course.

A mild pyrexia which only once reached 101°F. Returned to normal four days after admission. Patient did not appear to be ill. For some reason or other on the 5.6.37 the bladder became very distended and he had to be catherised. No rash seen in Hospital.

Laboratory Test.

Blood - Total leucocyte count 14,800 per c.mm.
Urine - A few epithelial cells and R.B.C.
Stools - No protozoa, ova or cellular exudate.

Wassermann Test on 4.6.37 was doubtful, but Kahn Test was negative.

SEROLOGICAL INVESTIGATION.

Widal Test.

4.6.37)
16.6.37) Negative in 1:25 and upwards.

Weil-Felix Reaction.

4.6.37. B.proteus OXK negative 1:100 and over.
B.proteus OX19 marked agglutination 1:1600.
B.proteus OX2 negative 1:25 and over.

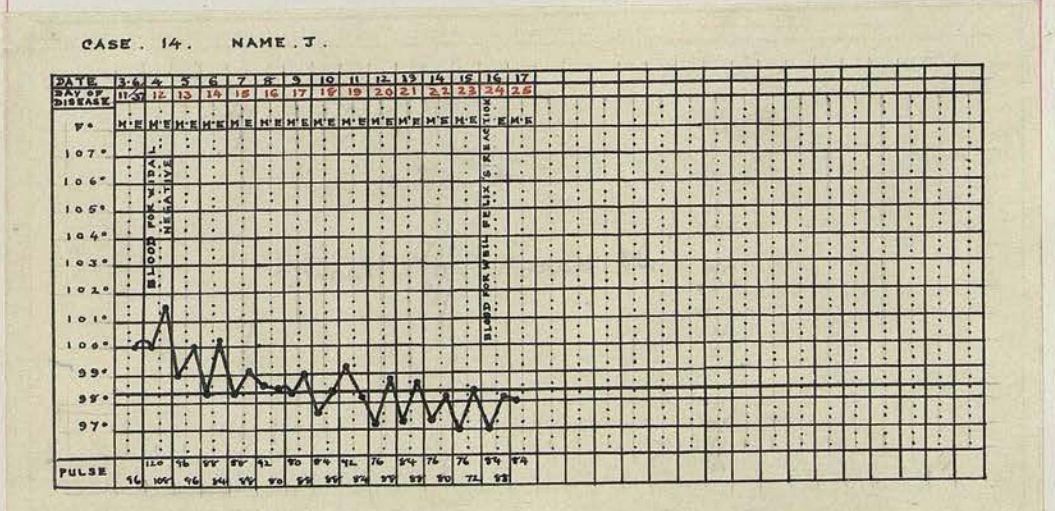
8.6.37. B.proteus OXK marked agglutination 1:30
B.proteus OX19 marked agglutination 1:1500
B.proteus OX2 marked agglutination 1:28

16.6.37. B.proteus OXK marked agglutination 1:34
B.proteus OX19 marked agglutination 1:500
B.proteus OX2 negative 1:25 and over.

Clinical Diagnosis - At first this case was thought to be one of Dengue Fever, but later it was diagnosed as ? Typhus.

Serological Diagnosis - Shop Typhus.

No rash, no history of insect bite and no glandular enlargement.



CASE 15.

M.A.T. Burman Male, aged 22. Admitted 16.6.37.

Complaint.

Fever of ten days duration. Fever rises towards evening with rigor and severe headache.

Previous History.

Of no importance. Denies exposure to venereal infection.

Physical Examination.

No rash and no Anaemia. Liver and spleen not palpable. Other systems normal.

Course.

Temperature did not rise above 99°F. for first two days after admission. On the 20.6.37, two days after admission left inguinal glands became enlarged and tender. No history of insect bite or local lesion to account for the glandular inflammation. No urethral discharge and patient denied exposure to venereal infection. Leucocyte count was done on 22.6.37 and found to be 14,800 per c.mm. and polymorphs 79%. On 21.6.37 a course of Milk Injections were given, the dosage being 2, 4, 6, 8, and 10 c.cs. on alternate/

alternate days. The first four doses gave sharp reactions. Between 26th and 28th fever came down to normal, but again rose on the 29th and kept at a higher level. The Bubo showed no signs of suppurating and was still very tender. The Wassermann Reaction was doubtful on the 26.6.37 but after a provocative dose of N.A.B. was found to be double plus on 8.7.37. On the 6.7.37 a course of D'Melcos vaccine was commenced and on 8.7.37 the superficial part of the Bubo burst of its own accord, leaving a mass of matted and indurated glands below. The temperature came down to normal the same day. Pyrexia lasted in all for about 30 days.

Laboratory Tests.

Sputum negative to Tubercle Bacillus.
Blood - No Microfilaria and no Malaria parasites seen.
W.R.C. 14,800 and Polymorphs 79%.
Stools and urine showed no abnormality.

Wassermann was at first doubtful, but after a provocative dose of N.A.B. was double plus.

SEROLOGICAL INVESTIGATION.

Widal Test.

6.7.37)
14.7.37) Negative to all in 1:25 and over.

Weil-Felix Reaction.

6.7.37. B.proteus OXK marked agglutination 1:800.
B.proteus OX19 negative 1.25 and over.
B.proteus OX2 negative 1.25 and over.

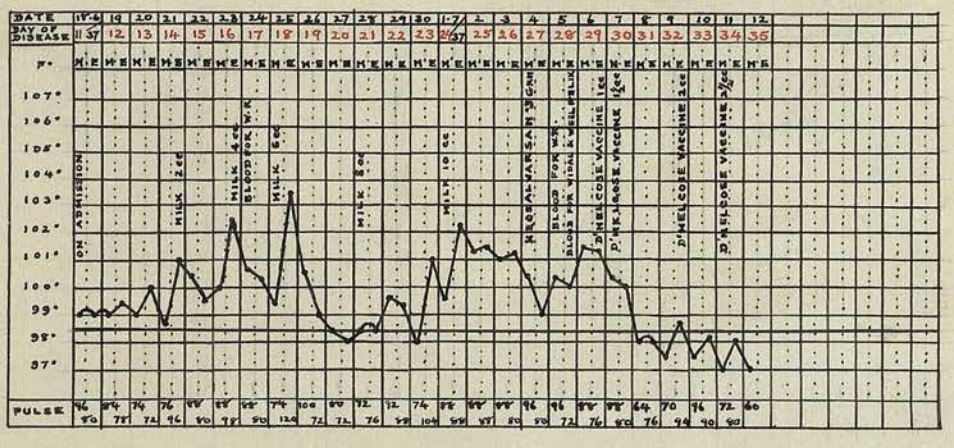
14.7.37./

14.7.37. B.proteus OXK marked agglutination 1:56.
B.proteus OX19) negative 1:25 and over.
B.proteus OX2)

Clinical Diagnosis - Tropical Bubo.

Serological Diagnosis - Scrub Typhus.

CASE. 15. NAME. A.T.



CASE 16.

M. Indian Female, aged 23. Admitted 14.7.37.

Complaint.

Continuous fever of fourteen days duration. No pains or aches. No glandular involvement and no history of insect bite.

Previous History.

Lives in a very congested part of Rangoon. Has lived in the same locality since childhood. Has always enjoyed good health except that she has been a martyr to colds.

Physical Examination.

She is very weak and anaemic. Teeth and gums very dirty. Tongue coated. Examination of abdomen revealed marked tenderness above both inguinal ligaments. Heart shows presence of loud haemic murmurs over all areas.

Vaginal examination showed marked tenderness over right tube. Has severe leucorrhoea.

Course.

From 14.7.37 to 19.7.37 her temperature ranged between 100°F. and 102°F. and eventually settled down on 20th. She was treated as a case of Enteric Fever. She left Hospital much relieved on 30.7.37.

Laboratory/

Laboratory Tests.

Urine - Acid with a trace of albumen.
Blood - Slight apparent leucocytosis. Polymorphs 80%

Wassermann Reaction double plus.

SEROLOGICAL INVESTIGATION.

Widal Test.

15.7.37. B.typhosus H marked agglutination 1:200
B.typhosus O marked agglutination 1:200

4.8.37. B.typhosus H negative 1:25 and over.
B.para AH marked agglutination 1:85 RT 17
B.para BH negative 1:25 and over.
B.typhosus O marked agglutination 1:34 RT 2
B.para BO negative 1:25 and over.

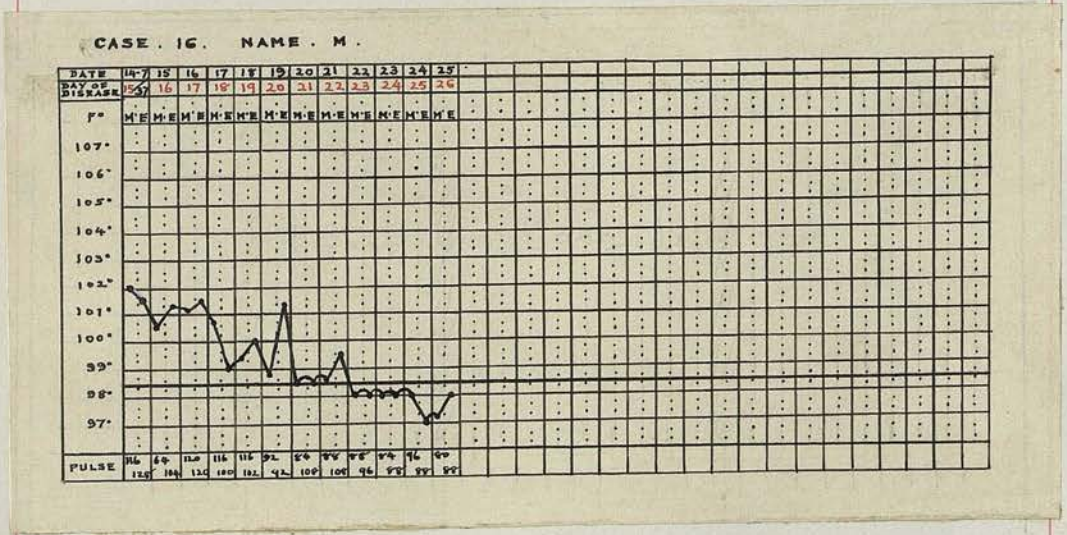
Weil-Felix Reaction.

15.7.37. B.proteus OXK marked agglutination 1:1600
B.proteus OX19) negative 1:25 and over.
B.proteus OX2)

4.8.37. B.proteus OXK marked agglutination 1:880
B.proteus OX19 marked agglutination 1:19.
B.proteus OX2 marked agglutination 1:56.

Clinical Diagnosis - Enteric Group.

Serological Diagnosis - Scrub Typhus.



CASE 17.

Mr. H.R. Anglo-Indian, aged 39. Admitted 25.12.37.

Complaint.

Continuous fever of sixteen days duration. Fever came on gradually with slight headache, constipation and cough, which was at times very severe. There was no rigor, no rash and no enlargement of glands. On the ninth day of fever he had a very severe subconjunctival ecchymosis of both eyes. From the fourteenth day he had very severe hiccough.

Previous History.

He is agent to a large timber and rice concern and as such has to spend a lot of his time travelling in the jungles. During these trips he has had many attacks of Malaria and about a fortnight before the present attack he underwent treatment for Malignant Tertian Malaria.

Physical Examination.

Looks very ill and emaciated. Eyes show very marked subconjunctival ecchymosis. Tongue is raw and red. Heart shows no abnormality beyond a rapid pulse. Lungs show moist sounds on both sides. Abdomen is distended and some fluid is present. Spleen is/

is enlarged and liver normal in size.

Course.

27.12.37. Vomited blood-stained fluid in the morning and in the evening had a severe haematemesis of bright red blood. Abdomen soft and free from tenderness. Slightly distended.

28.12.37. Large melaena stool. Pulse 120. Hiccough very troublesome. Expectorating blood-stained sputum.

Hiccough persisted till 31.12.37 despite all treatment. From 1.1.38 his condition has been more satisfactory but his fever persists. He shows signs of Cirrhosis of the liver.

Laboratory Tests.

Urine - Showed no abnormality.

Blood film - No Malaria parasites seen.

Polymorphs	75%
Mononuclears	12%
Lymphocytes	13%
Eosinophils	Nil.

Total W.R.C. 11,800.

Sputum - No Tubercle Bacilli seen. Gram positive cocci (Pneumococci) in abundance and short chained streptococci present.

SEROLOGICAL INVESTIGATION.

Widal Test.

23.12.37.	B.typhosus H agglutinates 1:100. B.typhosus O negative 1:25 and over.
4.1.38.	B.typhosus H agglutinates 1:100 B.typhosus O negative 1:25 and over.
14.1.38.	All negative 1:25 and over.

Weil-Felix Reaction.

28.12.37. B.proteus OXK negative 1:25 and over
B.proteus OX19 " " " "
B.proteus OX2 " " " "

4.1.38. B.proteus OXK negative.
B.proteus OX19 marked agglutination 1:800.
B.proteus OX2 negative 1:25 and over.

14.1.38. All negative 1:25 and over.

Wassermann Reaction was doubtful. The Wassermann had been positive on a former occasion and the patient had undergone a course of treatment.

Clinical Diagnosis — Pyrexia of unknown origin with Cirrhosis of Liver.

Serological Diagnosis - Shop Typhus.

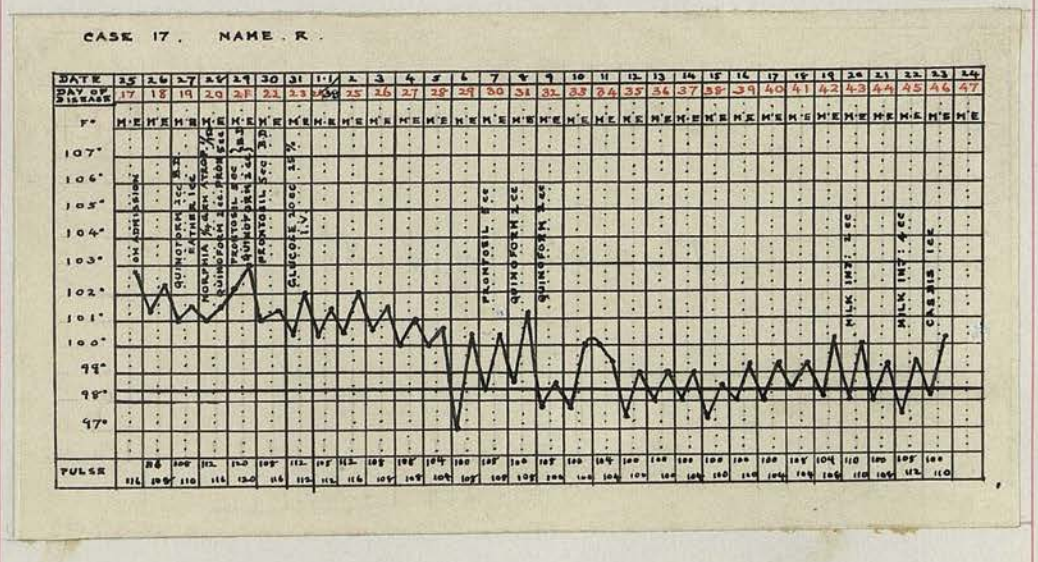


TABLE I

17 CASES SHOWING A POSITIVE WEIL-FELIX REACTION TO B. PROTEUS OXK, 1:500 & OVER AND B. PROTEUS OX19, 1:300 & OVER.

CASE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
RACE SEX — AGE	INDIAN MALE 22	EUROPEAN MALE 35.	INDIAN MALE 25	INDIAN MALE 17	INDIAN MALE 13	INDIAN MALE 35	BURMESE MALE 62	INDIAN MALE 50	EUROPEAN MALE 740	INDIAN MALE 26	INDIAN MALE 40	INDIAN MALE 46	INDIAN MALE 18	INDIAN MALE 39	BURMESE MALE 22	INDIAN FEMALE 23	ANGLO-INDIAN MALE 39.
ONSET	GRADUAL	GRADUAL	ABRUPT	ABRUPT	ABRUPT	GRADUAL	ABRUPT	ABRUPT	ABRUPT	ABRUPT	GRADUAL	ABRUPT	ABRUPT	GRADUAL	GRADUAL	GRADUAL	GRADUAL
DURATION OF FEVER	76 DAYS	34 DAYS	18 DAYS	18 DAYS	18 DAYS	25 DAYS	12 DAYS	15 DAYS	14 DAYS	14 DAYS	18 DAYS	15 DAYS	17 DAYS	15 DAYS	30 DAYS	21 DAYS	47 DAYS
RASH	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
WEIL-FELIX	OXK 1:770 1:1280 1:800	OXK 1:1600 1:1600 1:1600	OX19 1:1280 1:1700 1:565	OXK 1:600 1:565	OXK 1:1130 1:1500	OX19 1:6450	OX19 1:3000 1:1700 1:300	OX19 1:282 1:300	OX19 1:600 1:30	OX19 1:5650 1:1500	OX19 1:400 1:800 OXK 1:800	OXK 1:4400 1:3800	OXK 1:800	OX19 1:1600 1:1500 1:500	OXK 1:800 1:56	OXK 1:1600 1:880	OX19 1:25 1:800
WIDAL	—	—	TH 1:3000 TO 1:32	TH 1:1700 TO 1:1925 TH 1:3850 TO 1:1925	—	—	—	—	TH 1:322 TO 1:332	—	—	—	—	—	—	~~B~~TH 1:200 ~~B~~TO 1:200	~~B~~TH 1:100
WASSERMANN	—	+ +	—	—	—	+ +	+ +	—	—	+ +	+ +	+ +	—	±	± + ±	+ +	+ ±
KAHN	—	+ +	—	—	—	+	+ +	—	—	+	+ +	+ +	—	—	+		—
CLINICAL DIAGNOSIS	KALA-AZAR	PUO & SECONDARY LUES	? TYPHUS	TYPHOID	KALA AZAR	TYPHUS GROUP.	MALARIA & HEPATITIS	PUO	TYPHUS	TYPHUS	MALARIA	TYPHUS GROUP	MALARIA	? TYPHUS GROUP	TROPICAL BUBO	ENTERIC GROUP	PUO & CIRRHOSIS LIVER
SEROLOGICAL DIAGNOSIS	OXK	OXK	OX19	OXK	OXK	OX19	OX19	OX19	OX19	OX19	OX19	OXK	OXK	OX19	OXK	OXK	OX19
RESULT	CURED	CURED	RELIEVED	DIED	CURED	DIED	CURED	CURED	CURED	CURED	RELIEVED	RELIEVED	CURED	CURED	RELIEVED	CURED	STILL IN HOSPITAL
REMARKS	60 TH DAY 70 TH DAY 85 TH DAY	22 ND DAY 29 TH DAY 41 ST DAY	17 TH DAY 25 TH DAY 45 TH DAY	7 TH DAY 17 TH DAY	11 TH DAY 19 TH DAY	26 TH DAY	18 TH DAY 33 RD DAY 49 TH DAY	23 RD DAY 35 TH DAY	10 TH DAY 20 TH DAY	12 TH DAY 22 ND DAY	11 TH DAY 22 ND DAY	13 TH DAY 19 TH DAY	16 TH DAY	11 TH DAY 16 TH DAY 23 RD DAY	28 TH DAY 36 TH DAY	15 TH DAY 33 RD DAY	

TABLE II

CASES SHOWING A TITRE OF 1:100 AND OVER BUT LESS THAN THE STANDARD TAKEN FOR A DIAGNOSTIC FINDING AND CLASSIFIED AS DOUBTFUL.

CASE	18	19	20	22	23	28	40	48
RACE SEX — AGE	INDIAN. MALE 35	BURMESE FEMALE 35	INDIAN. MALE 40	INDIAN MALE 26	ANGLO-INDIAN FEMALE 18	INDIAN. MALE 24	BURMESE MALE 49	INDIAN. MALE 21
ONSET	GRADUAL	ABRUPT	ABRUPT	GRADUAL	GRADUAL	ABRUPT	GRADUAL	ABRUPT
DURATION OF FEVER	?	24 DAYS	10 DAYS	30 DAYS	37 DAYS	14 DAYS	4 MONTHS	8 DAYS
RASH	NIL	NIL	NIL	NIL	NIL	NIL	NIL	NIL
WEIL-FELIX	OXK 1:100	OXK 1:100	OXK 1:100	OXK 1:150	OXK 1:100 1:200 1:141	OXK 1:100	OXK 1:170	OXK 1:170
WIDAL	NEGATIVE	—	TH. 1:100 TO. 1:200	NEGATIVE	TH. 1:100 TO. 1:200 TH. 1:322 TO. 1:367	NEGATIVE	NEGATIVE	NEGATIVE
WASSERMANN	—	+ +	—	±	+ +	—	+ +	—
KAHN	—	+	—	—	+ +	—	+	—
CLINICAL DIAGNOSIS	ABDOMINAL TUBERCULOSIS	B. COLI PYELITIS	MALARIA M.T. RINGS IN BLOOD	TYPHOID FEVER	TYPHOID AND SYPHILIS	SUSPECTED TYPHUS	TUBERCULOSIS OF BOTH LUNGS CONFIRMED BY X-RAY.	MUMPS.
SEROLOGICAL DIAGNOSIS								
RESULT	LEFT HOSPITAL	CURED	CURED	CURED	DIED	CURED	LEFT HOSPITAL	?
REMARKS	—	PURE CULTURE IN URINE OF B. COLI.			SEVERE HAEMORRHAGE FROM BOWEL			TRANSFERRED TO FEVER HOSPITAL

TABLE 111.

Race incidence of all cases examined.

Europeans	..... 3.
Anglo-Indians	..... 3.
Burmans	..... 18.
Chinese	..... 6.
Indians	..... 70.

TABLE 1V.

Positive and Doubtful Cases.

	OXK.	OX19.	OX2.	Total.
Positive	7.	10.	-	17.
Doubtful	8.	-	-	8.

TABLE V.

Race incidence of Positive Cases.

	OXK	OX19	OX2	Total.	
Europeans	1	1	-	2	
Anglo-Indians	-	1	-	1	
Burmans	-	2	-	2	
Indians	6	6	-	12.	17.

TABLE V1.

Doubtful Cases.

	OXK	OX19	OX2	Total.	
Europeans	-	-	-	-	
Anglo-Indians	1	-	-	1	
Burmans	2	-	-	2	
Indians	5	-	-	5.	8.

COMMENTARY.

It appears, from a study of the literature on the Typhus Group of Fevers in India, Burma and the Malay States, that all the authors concerned are agreed that the Weil-Felix Reaction is specific. Nevertheless this investigation suggested itself to me because cases have been encountered in my practice from time to time, which, though in no way resembling Typhus Group Fevers clinically, yet showed a high titre when agglutinated against the Proteus Group of organisms.

It would be unwise to dogmatise on the findings of so small a series of cases as mine, but if a positive Weil-Felix Reaction is to be taken as a criterion for the diagnosis of Typhus Group Fevers, then an examination of the foregoing cases brings out many interesting points.

To begin with it might appear that the Typhus Group of Fevers is very common in Rangoon, an occurrence hitherto quite unsuspected, for it will be seen that out of one hundred cases examined, no less than seventeen proved to be serologically positive by the Weil-Felix Reaction. These figures are even higher than those recorded by Maitra (32), in whose series of 506 sera, sent to him from different parts of/

of this country, no less than 13.2% were classified as positive and 5% as doubtful.

In my series, seven cases gave a positive reaction with B. proteus OXK and ten with B. proteus OX19, while there was no positive reaction with OX2. In Maitra's series the OX19 positive cases were almost double those of OXK.

As regards race incidence, twelve out of my seventeen cases occurred amongst Indians, two amongst Europeans, one Anglo-Indian and only two amongst Burmans and in the 'Doubtful' group five of the eight cases also occurred amongst Indians. Various factors go towards explaining this predominance amongst Indians, chief of which are that most of the Indians admitted to the Rangoon General Hospital are non-residents of Rangoon and therefore have no permanent place of abode to lie up in when stricken with a fever. Large numbers of Indians immigrate to Burma annually to seek work as dock labourers and also to work in the paddy fields during the rice harvest. The Burman adopts a higher standard of living, usually has a comfortable home, and as a great believer in 'Burmese Medicine' prefers to stay at home. He only comes into Hospital when all else fails or as it happens from time to time when he gets ill in Rangoon while on a visit from the district.

On/

On further examination of the cases detailed in this investigation, a feature that at once assumes importance is that of the seventeen cases shown as positive to the Typhus Group of Fevers on serological grounds, only six presented a clinical picture suggestive of this group of fevers. The average duration of fever in these clinically positive cases was sixteen days with a maximum of twenty-five days in one case and a minimum of fourteen days in two cases.

Only two of these cases, both Europeans, showed a rash. In one case, No.9, a typical Typhus Fever, the rash more resembled the 'Rose spots' of Typhoid than the characteristic Typhus rash and in the other case the rash resembled that of a Secondary Syphilis. Case No.9 was the only clinically positive case that left no doubt as to the diagnosis of Typhus Fever.

In the remaining eleven cases if the routine Weil-Felix Test had not been carried out, the presence of a positive reaction would never have been suspected nor would it have influenced in any way the further management of the cases.

Let us examine Table 1. more closely, Case No.1 is clinically a case of Kala Azar with a total duration of fever of 76 days and yet on the 60th day of the fever the Weil-Felix Reaction shows a titre of 1:700 to B.proteus OXK rising to 1:1280 on the 70th day/

day and falling to 1:800 on the 85th day. Case No.2 which shows a high titre to B.proteus OXK on three occasions did not suggest Typhus clinically. Case No.4 is of still greater interest. Here the patient's serum agglutinated B.proteus OXK in dilutions of 1:600 and 1:565 on the 7th and 17th days of the disease and on the same days it was positive to the Widal Test, showing a TH of 1:1700 and TO of 1:1925 on the 7th day and a TH of 1:3580 and a TO of 1:1925 on the 17th day. The Weil-Felix titre fell between the 7th and 17th days, whereas the TH rose, the TO remaining at its former high level.

There are three possibilities here -

1. That the case was one of Typhoid Fever with heterologous production of Proteus agglutinins.
2. Typhus Fever with heterologous production of Typhoid agglutinins.
3. A dual infection.

This case was an undoubted case of Typhoid (a very common disease in Rangoon), both serologically and clinically. It is possible of course that a dual infection occurred, but I consider this unlikely in the absence of any definite clinical signs of Typhus Fever.

Moreover on further examination of Table 1, it will be seen that Case 5, Kala Azar; Case 7, Chronic/

Chronic Malaria; Case 11, Malaria; Case 13, Malaria; Case 15, Tropical Bubo and Case 16, Enteric Group, would all have to be classified as dual infections, coincidences which to my mind are beyond reasonable probability.

In turning to the eight doubtful cases, we find that they all show titres varying between 1:100 and 1:200 OXK and here we also find similar anomalies. Case No.20, a straightforward case of Malignant Tertian Malaria with parasites in the blood shows a Weil-Felix Reaction of 1:200. In case 23, a classical case of Typhoid Fever, we find the serum showing a titre to OXK of 1:100, 1:200 and 1:141 at different periods of the disease. It should be noted that only one of these doubtful cases was suspected to be suffering from Typhus, the remaining doubtful cases being diagnosed as Mumps, Phthisis, Pyelitis, etc.

Of the remaining 75 cases classified as Negative, 14 showed a rise in titre for B.proteus OXK between 1:50 and 1:74 and one only for B.proteus OX2 in a dilution of 1:50. All were negative for B. proteus OX19 in dilutions of 1:25 and over.

As has been said in a previous part of this research, various arbitrary titres have been assumed by writers to denote a positive diagnosis. Bridges looks/

Bridges looks upon a titre of 1:50 to be suspicious and most writers are content to accept titres in the vicinity of 1:200 as diagnostic. In my own series titres ranging between 1:600 and 1:6450 were obtained though in the majority of cases diagnosed clinically the titres were on the whole fairly high, such as 1:1700, 1:6450, 1:5650, 1:4400, 1:1600.

In view of the evidence obtained in this investigation, I am of opinion that the Weil-Felix Reaction with B.proteus OXK and OX19 is not specific for the Typhus Group of Fevers met with in Rangoon and that Typhus has primarily to be diagnosed on clinical grounds; if at the same time the Weil-Felix is positive in a high dilution it may be looked upon as an additional aid to diagnosis.

It seems clear that titres of 1:300 and over (in fact some very high titres) are not uncommonly found in conditions other than Typhus Group of Fevers in Rangoon.

SUMMARY.

1. A short history of Typhus Fevers met with in India, Burma and the Federated Malay States is given.

2. Serological findings by investigators in these countries are reviewed.

3. The source and method of preparation of cultures and suspensions used for the Weil-Felix Reaction in this investigation are described.

4. Symptoms and signs met with in Tropical Typhus are mentioned.

5. One hundred cases of fever, mostly admitted to the Wards of the Rangoon General Hospital, were submitted to a Clinical and Serological examination.

6. The Widal, Weil-Felix, Wassermann and Kahn Tests were carried out on these cases, as well as any other Laboratory Test deemed necessary to establish a diagnosis.

7. An arbitrary titre of 1:500 was assumed to represent a positive or diagnostic reaction for B.proteus OXK and 1:300 for B.proteus OX19 and OX2.

8. In this series seventeen cases gave a Positive Weil/

Weil-Felix Reaction. Seven cases were positive to OXK, ten to OX19 while no positive reaction to OX2 was encountered.

9. The seventeen Serological Positive cases are described in detail.

10. Eight cases were classified as 'Doubtful". In these cases the minimum titre was arbitrarily fixed as 1:100 and the maximum just below the standard taken for a positive finding.

11. Of the seventeen Serologically Positive cases only six were suspected to be suffering from Typhus Fever on Clinical grounds alone. In these cases the Weil-Felix Reaction showed uniformly high titres, ranging from 1:1600 to 1:6450.

12. The remaining eleven cases although they showed high titres in the Weil-Felix Reaction, were proved on Clinical grounds to be cases of other diseases such as Typhoid, Kala Azar and etc.

13. Of the seventy-five negative cases, no less than fifteen showed a rise in titre by the Weil-Felix Reaction ranging from 1:56 to 1:76. Five of these were definitely proved to be cases of Typhoid, Malaria, Pyelitis, etc. All these rises in titre were against B.proteus OXK.

14. A rash was only seen in two cases, both Europeans. In neither case was the rash in any way typical of Typhus Group Fevers. The rashes are described in the text.

15. None of the hundred cases under review gave any history of insect bite nor was any glandular or lymphatic involvement met with.

CONCLUSIONS.

1. Cases resembling the Scrub and Shop Typhus of the Federated Malay States, both Clinically and Serologically, are met with in Rangoon.

2. Typhus Group Fevers in Rangoon are on the whole of a mild character. Of the seventeen Serologically Positive cases only two cases died. One case is included in the six cases diagnosed clinically, the other was a case of Typhoid Fever. Only one case, No.9, was really seriously ill and had a prolonged convalescence.

3. This investigation shows that a high titre to the B.proteus group of organisms is met with in diseases that are not Typhus Fever.

4. That the Weil-Felix Reaction cannot therefore be regarded as a specific reaction for the Typhus-like Fevers met with in Rangoon.

5. Typhus Group Fevers must be diagnosed on clinical grounds. A positive Weil-Felix Reaction, provided the titre is really high, 1:3000 and over, may be regarded as further confirmatory evidence only.

6./

6. A rising titre is not very helpful as it was observed in clinically negative cases as well as in those both clinically and serologically positive.

7. A rash need not necessarily be present for a diagnosis to be made.

8. No evidence was obtained to suggest the nature of the transmitting agent.

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